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July 18, 1996

Richard A. Guida, Associate Director for Regulatory Affairs
Department of the Navy (Code NAVSEA 08U)
Naval Nuclear Propulsion Program
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

RE: State of Nevada's Comments: Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel

Dear Mr. Guida:

Enclosed is the State of Nevada's comment on the Department of Navy's *Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel.* The comments are intended to assist the Navy in preparing the final EIS and record of decision.

A The draft EIS evaluates six alternative container systems for spent fuel storage, transport, and disposal as well as impacts from manufacturing, handling and transportation; yet a preferred alternative was not presented in the document. While the document indicates the Navy intends to select a container system that will meet "multiple" storage, transportation, and disposal needs, there are numerous programmatic, regulatory and technical issues which dictate that the proposed action should be limited to the selection of a container system to meet the exclusive need for on-site transportation and interim storage of naval fuel at the Idaho Engineering Laboratory (INEL). The enclosed comments provide regulatory and technical analysis to support this conclusion.

Because no repository or central interim storage location has been identified - and may not be for many years, it is inappropriate for the Navy to use the current EIS as the vehicle for evaluating transport, storage, or disposal impacts or for supporting future decisions with regard to such activities. The analysis of transport, interim storage, and/or disposal impacts and alternatives should be done as part of the broader environmental impact statement process DOE is required to carry out under the Nuclear Waste Policy Act of 1982, as amended. By the same token, DOE, as a cooperating agency in the Navy's DEIS process, cannot use the extremely limited Navy document to support *any* future decisions regarding canister systems for storage or disposal of commercial spent nuclear fuel or defense high-level radioactive waste at an interim storage facility or a repository or for transport of such materials to these facilities.

Should you have questions regarding the attached comments, please feel free to contact me.

Sincerely,

Robert R. Loux
Executive Director

RRL/cs
Enclosure
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Date: 7/18/96 **Time:** 10:10 AM **Total Pages:** 29

Comments: ATTACHED ARE THE STATE OF NEVADA COMMENTS ON THE NAVY"S DRAFT EIS FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL. THE ORIGINALS OF THE COMMENTS AND COVER LETTER ARE IN THE MAIL.

STATE OF NEVADA COMMENTS ON THE DEPARTMENT OF THE NAVY'S DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A CONTAINER SYSTEM FOR THE MANAGEMENT OF NAVAL SPENT NUCLEAR FUEL

Prepared by
The Nevada Agency for Nuclear Projects

The State of Nevada's comments on the Department of the Navy's Draft Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel (draft EIS) reflect 13 principal areas of concern. These include the Navy's public participation process, the lack of a preferred alternative, the overall level of information in the draft EIS, the analyses of worse case accidents, the overall transportation analyses, environmental justice, waste characteristics, waste acceptance, environmental impacts and analyses, and the relationship between Navy activities contemplated under the draft EIS and other closely related activities (i.e., the U.S. Department of Energy's (DOE) civilian high-level radioactive waste program, Nevada Test Site (NTS) activities, Idaho National Engineering Laboratory (INEL) activities, etc.).

A

The comments which follow were prepared in response to the information and alternatives presented in the draft EIS and address the entire range of issues and actions suggested by the draft document as it was released for comment. It should be pointed out, however, that, while we have made comments with respect to transportation, storage, and disposal issues covered by the draft EIS, the State of Nevada contends that the proposed action to be included in the final EIS must be limited to the selection of a canister system and related support facilities for the interim storage of Naval spent nuclear fuel and Special Case Waste at the Idaho National Engineering Laboratory. Because no repository or central interim storage location has been identified, and may not be for some time, it is inappropriate for the Navy to use this EIS as the vehicle for the evaluation of transport, storage, or disposal impacts or to support future decisions with regard to such activities. The analysis of transport, interim storage, and/or disposal impacts and alternatives should be done as part of the broader environmental impact statement process DOE is required to carry out under the Nuclear Waste Policy Act of 1982, as amended.

By the same token, DOE, as a cooperating agency in the Navy's EIS process, cannot use this extremely limited Navy document to support any future decisions regarding canister systems for storage or disposal of commercial spent nuclear fuel or defense high-level radioactive waste at an interim storage facility or a repository or for transport of such materials to these facilities.

B

1.0 Preferred Action Alternative

As currently written, the draft EIS evaluates six alternative container systems for spent fuel storage, transport, and disposal. The document also evaluates impacts from the manufacturing, handling, and transportation of these container systems, as well as the modification of existing facilities for spent fuel loading. Additionally, the document evaluates various sites and facilities at INEL that could be used for above ground dry storage. However, the draft EIS does not contain a preferred alternative for the overall management of Naval spent nuclear fuel (SNF) and Special Case Waste (SCW). Nevertheless, statements in the document specifically suggest that a single preferred alternative is needed to allow the Navy to load and store spent nuclear fuel at INEL in containers which will be used to ship the spent nuclear fuel outside the state of Idaho. The document also states that the "Multi-Purposed Canister, Dual-Purpose Canister, Transportable Storage Cask, and Small Multi-Purpose Canister could effectively meet [this need]."[1]

While Nevada's review of the draft EIS does not contain a detailed analysis of the merits of each of these container systems, it does examine certain technical, programmatic, and regulatory compliance issues that must be considered in the selection of a proposed action (preferred alternative) for the final EIS. Foremost of these are issues related to off-site transportation of Navy SNF and SCW, as well as issues related to waste disposal/waste acceptance. In fact, examination of these fundamental issues in the draft EIS is so deficient that Nevada officials contend that the Navy will be unable to complete a final EIS and Record of Decision that can adequately support any decisions regarding off-site transportation and waste disposal issues.

For example, the implementing regulations of the National Environmental Policy Act (NEPA) are very specific concerning limitations on actions during the NEPA process, consideration of actions that are connected, deliberation of actions that flow from a program plan or policy to a lesser scope, and consideration of actions that are "ripe" for discussion. These regulations[2] purposely restrict actions that would impact the environment while an agency is in the process of preparing either a site-specific or a programmatic EIS, if such actions "prejudice pending decisions" or otherwise "determine subsequent developments" or "limit alternatives." This is notable since certain actions contemplated in the Navy's draft EIS are directly connected to a larger programmatic action encompassed by the EIS required for the Yucca Mountain

[1] See draft EIS, page 3-26

[2] 40 CFR 1501.6
40 CFR 1508.18(b)(3)
40 CFR 1508.28

Repository.[3] In preparing the Repository EIS, the Department of Energy must consider, in detail, the total spectrum of transportation and disposal issues as "systematic and connected agency decisions [which] allocate agency resources to implement a specific statutory program . . . "[2] Because the existing NEPA requirements contained under the Nuclear Waste Policy Act have not been concluded, preparation of a site-specific EIS such as the Navy's draft EIS is inappropriate and, in fact, violates the referenced NEPA implementing regulations (at least as it relates to transportation and disposal issues).

Consequently, State officials strongly suggest that the proposed action in the final EIS be limited strictly to the selection of a container system(s) and related support facilities that serve the exclusive need for on-site transportation and interim storage of Navy spent nuclear fuel and SCW at INEL.

As already noted, the draft EIS does not specify a proposed action or preferred alternative. Without an articulated proposed action or preferred alternative, it is difficult to evaluate the document and determine if the information presented is adequate. If one of the two Multi-Purpose Canister (MPC) alternatives is selected as the preferred action, for example, much more information would be needed on the relationship between MPC performance, fuel characteristics, and implications for ultimate disposal in a repository (since the MPC, by definition, would be designed to also serve as a disposal canister). The final EIS must include sufficient information so that the appropriateness of the preferred alternative that is identified can be adequately evaluated.

C 2.0 Public Participation

Limiting public hearings on the draft EIS to two in Idaho and one in Utah calls into question the adequacy of the Navy's public involvement/participation process for the EIS. The contention that, since a definitive repository or interim storage location is not known, public hearings need not be held in Nevada or in potential transportation corridor states, is flawed. Nevada is used in the EIS as the reference destination for Naval SNF and SCW, and routes between Idaho and Yucca Mountain/NTS are identified. Public hearings should have been scheduled to provide opportunities for public involvement in Nevada and in states/communities along the referenced shipping routes. At least four additional hearings should be held in Nevada and in western states potentially affected by Navy shipments of spent reactor fuel. These meetings should be scheduled in consultation with the Western Interstate Energy Board's

[3] See U.S. Department of Energy, Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada. (Federal Register, Volume 60, No.151, August 7, 1995, pp. 40164-40170).

Radioactive Waste Committee, which has been very active and effective in assisting western states in planning for the safe and uneventful shipment of spent fuel and high-level waste.

D 3.0 Overall Level of Information

The overall level of information in the draft EIS is inadequate. There is no information on the characteristics of Naval spent nuclear fuel or how such fuel is different from commercial spent fuel. There is also no information on the characteristics of the Special Case Waste referred to in the draft EIS. Without this information, issues such as criticality, thermal impacts, and compatibility with other waste forms cannot be assessed. The lack of sufficient information limits reviewers from assessing the adequacy of risk and performance assessments. Likewise, the comparative health risks analyses contained in the draft EIS are unsupported because of the lack of technical data. If the Navy is contending that such information in unavailable because it is classified, there should be a classified appendix as part of the final EIS that can be reviewed by State or local experts with appropriate clearances.

E 4.0 Worse Case Accidents

The analysis of worse case accidents is inadequate in the draft EIS. The argument that the Navy is not required to evaluate risks and impacts from low probability/high consequence events is inappropriate. Credible worst case accidents both at INEL during loading and storage and subsequently during shipment off-site should be analyzed. The claim that the Naval SNF waste form is rugged and therefore presents little risk during transport or storage is unsupported, especially in the absence of adequate information on waste form characteristics.

F 5.0 Overall Transportation Analyses

5.1 Background Information on the Current and Projected Inventory of Naval Spent Nuclear Fuel

The final EIS must provide sufficient information on the amount of naval spent nuclear fuel to be shipped to a repository or interim storage facility so that reviewers can verify the hardware requirements and number of shipments required under each alternative. Neither the draft EIS nor the DOE Programmatic Spent Nuclear Fuel Management Final EIS (DOE/EIS-0203-F) provide sufficient information to allow independent verification of the hardware requirements stated in Table S.1 and Table 3.1 and the shipment numbers stated in Tables S.7, 7.1, 7.2, B.2, B.3, and B.4. For each of the Naval SNF types referenced on Pp. 2-1 to 2-2, the final EIS must provide the following information: the current and projected amount of SNF (in Metric Tons of Initial Heavy Metal); the current and projected number of cores or assemblies;

the physical dimensions and weight of each representative fuel type; and the assumed capacity (in cores or assemblies) of each alternative container system described in Appendix D.

The final EIS must provide sufficient information on the radiological characteristics of Naval spent nuclear fuel to be shipped to a repository or interim storage facility so that reviewers can verify the purported public health impacts, worker health impacts, environmental impacts, and socioeconomic impacts under each alternative. Neither the draft EIS nor the DOE Programmatic Spent Nuclear Fuel Management Final EIS provide sufficient information to allow independent verification of the radiological risks stated in Tables S.2 through S.8, Tables 3.2 through 3.4, Tables 3.7 through 3.9, Tables 7.3 through 7.6, and Appendix B. The final EIS must provide radiological characteristics for each of the Naval SNF types referenced on Pp. 2-1 to 2-2, including radionuclide composition, total radioactivity, surface dose rate, thermal output, and projected change over time for each of these characteristics.

G 5.2 Heavy Haul Truck Transportation

The final EIS must address a broad range of impacts associated with potential heavy haul truck (HHT) transportation of Naval spent nuclear fuel containers to the repository or interim storage facility. There is no direct rail access to Yucca Mountain or the Nevada Test Site at the present time. The nearest main railroad is almost 100 miles distant. DOE is currently studying four corridors (ranging in length from 98 to 363 miles) for possible construction of a new rail spur to the repository site. The potential for direct rail access is uncertain because of high costs (estimated as high as $1 - 1.5 billion), anticipated difficulties in obtaining environmental approvals and acquiring rights-of-way, and pending congressional legislation that would require DOE to ship rail casks by HHT from an intermodal transfer facility at Caliente. The final EIS cannot assume that direct rail access will be available for delivery of Naval spent nuclear fuel containers to the repository or interim storage facility.

The final EIS must extend the route-specific transportation risk and impact analyses contained in Appendix B and presented in Chapter 7.0 and the Executive Summary, to incorporate the three potential HHT routes identified by DOE in the Nevada Potential Repository Preliminary Transportation Strategy Study 2 (February 1996). These potential routes are listed below:

(1) Apex Route: Interstate 15 - U.S. Route 95 - Jackass Flats Road (104 miles);

(2) Arden Route: State Route 160 - U.S. Route 95 - Lathrop Wells Road (111 miles); and

(3) Caliente Route: U.S. Route 93 - State Route 375 - U.S. Route 6 - U.S. Route 95 - Lathrop Wells Road (321 miles).

The route-specific transportation risk and impact analyses contained in Appendix B must also consider the so-called "Chalk Mountain Heavy Haul Route" from the Caliente intermodal transfer facility specified in Senate Bills S.1271 and S.1936. This route covers U.S. Route 93 - State Route 93 - Local roads from Rachel to Nevada Test Site Guard Station 700 - Mercury Highway - Cane Spring Road (approximately 160 miles).

In light of the potential requirement for long-distance HHT transportation from a Nevada rail siding to the repository or interim storage facility (100 to 320 miles), the final EIS must reevaluate the feasibility of the various container system alternatives described in Chapter 3.0 and Appendix D. In particular, use of the M-140 transportation cask may be incompatible with HHT transport because of its loaded weight, height (16 ft.), and vertical shipping configuration. The M-140 transportation cask is usually transported in a specially designed well-type railcar. The draft EIS provides no evidence that M-140 transportation casks have ever been, or can potentially be, shipped by HHT for distances of 100 to 320 miles. Indeed, there in no evidence in the draft EIS that the other proposed container systems can be safely and economically shipped by HHT for distances of 100 to 320 miles.

The final EIS must demonstrate that each of the proposed container system alternatives is compatible with long distance HHT transport. The final EIS must specifically consider: (1) the need to obtain special HHT shipping permits from the Nevada Department of Transportation, (2) existing seasonal prohibitions on HHT use of certain route segments, and (3) potential additional state or local regulations such as time-of-day restrictions or escort requirements. Furthermore, the transportation cost analysis must specifically include the backhaul (return shipment) of empty transport-only casks and MPC transportation overpacks. Based on our analysis of the specific HHT routes likely to be used for shipments to Yucca Mountain or the Nevada Test Site, we believe that the small MPC is the only container system identified in the draft EIS that could possibly be feasible if there is no rail access. However, there will be so many difficulties involved in HHT transport of the small MPC that, absent rail access, legal-weight truck casks may the preferred or only feasible method of shipping Naval spent nuclear fuel from INEL to Yucca Mountain or the Nevada Test Site.

The final EIS must include revised transportation risk and impact analyses which specifically consider HHT transportation of Naval spent nuclear fuel on likely Nevada highway routes. For example, the analysis of routine radiological emissions from large MPCs on HHTs must consider the relatively slow HHT operating speeds (averaging 15 - 40 miles per hour) and limited passing opportunities for other vehicles traveling behind or alongside HHTs on long uphill grades or on heavily congested route segments. Given existing Nevada highway route characteristics, passengers of other vehicles (particularly elevated vehicles such as school buses, passenger vans, recreational vehicles, or pickup trucks) could regularly travel within 2 - 4 meters of the MPC surface for periods of an hour or more.

Similarly, the definition of the maximally exposed individual (MEI) must consider the exposures resulting from incidents involving large MPCs or other shipping containers on HHTs. The discussion on page B-6 of maximum possible radiological doses for MEIs during incident-free transportation is seriously deficient in this regard. The draft EIS assumes an MEI in the general population as "a person stopped next to a loaded transportation cask on a railcar at a distance of 19.8ft. (6 m) for one hour." In a credible gridlock incident, as described by DOE in response to questions by the Nuclear Waste Technical Review Board, one or more occupants of an elevated vehicle could be trapped within 2 meters of the surface of a spent fuel cask shipped by truck for a period of 3 - 4 hours, resulting in a dose of 30 - 40 millirems to each MEI. Moreover, if a multiple-occupant vehicle such as a school bus or passenger van is involved in such an incident, or if many single-occupant vehicles are involved in a gridlock incident at a congested urban intersection during evening rush hour, as many as ten or more individuals could receive the maximum radiological dose (30 - 40 millirems) and many other individuals could receive lesser but measurable doses.

Section B.3.2, "Technical Approach for Transportation Accidents", Section B.3.4, "Analysis of Uncertainties", Section B.4, "Routing Analysis", and Section B.5.2, "Accident Risk", must all be revised to address the probabilities and consequences of accidents involving large MPCs and other alternative shipping containers on HHTs while traveling likely highway routes in Nevada. In particular, the final EIS must specifically address the consequences of a maximum credible severe accident involving a release of radioactive materials from a large MPC or other large shipping container during HHT transport. In order to accurately assess the maximum credible accident impacts, the final EIS should evaluate the consequences of such an accident at worst case locations along likely Nevada shipment routes. For the urban HHT routes currently under consideration, the final EIS should evaluate a maximum severe accident at the intersection of I-15 and U.S. 95 in Las Vegas on a weekday during evening rush hour. For the rural HHT routes currently under consideration, the final EIS should consider a maximum severe accident at the intersection of State Routes 375 and 318 at Crystal Spring.

H 5.4 Reliance Upon the Modal Study

The transportation radiological risk estimates presented in Chapter 7.0 and Appendix B of the draft EIS rely excessively, and uncritically, upon one reference - the so-called Modal Study (U.S. Nuclear Regulatory Commission, 1987, Shipping Container Response to Severe Highway and Railway Accident Conditions, NUREG/CR-4829, prepared by Lawrence Livermore National Laboratory, for the U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory

Research, Washington, D.C.). The final EIS must correct this deficiency by responding to the detailed technical critiques of the Modal Study prepared by the Western Interstate Energy Board and the State of Nevada.

The State of Nevada submits for the record of this EIS the following report (see Attachment I to these comments): Lindsay Audin, Nuclear Waste Shipping Container Response to Severe Accident Conditions: A Brief Critique of the Modal Study, NWPO-TN-005-90 (December, 1990). This report documents five major deficiencies in the Modal Study: limited peer review and inadequate response to technical criticism by the peer reviewers; excessive reliance on an analysis of data created solely for the purpose of the study and inappropriate surrogate data; accident scenarios which do not capture the full range of real world conditions; inappropriate cask design assumptions and cask accident response assumptions; and non-representative spent fuel characteristics and undocumented spent fuel accident response assumptions. As a result of these deficiencies, the Modal Study is of limited value for assessing the risks and impacts of spent nuclear fuel shipments to a repository or interim storage facility. Moreover, specific aspects of the proposed shipments of Naval spent nuclear fuel are inconsistent with assumptions used in the Modal Study. The draft EIS assumes shipments in large rail casks using depleted uranium for gamma shielding, which limits the applicability of the Modal Study's focus on cask outer shell strain as a primary failure mode. The draft EIS assumes the use of casks with much greater capacities, which is inconsistent with the cask-payload weight ratios assumed in the Modal Study, and the physical and radiological characteristics of Naval spent fuel (and the resulting isotope concentrations) are so different from those assumed in the Modal Study that the Study's conclusions regarding the percentage of severe accidents involving releases may be inapplicable to the shipping campaign addressed in the draft EIS.

5.5 Consequences of Severe Transportation Accidents

The transportation radiological risk estimates presented in Chapter 7.0 and Appendix B of the draft EIS refer to a maximum severe transportation accident resulting in a release of radioactive materials. The information provided in the draft EIS is insufficient for the independent verification of the results presented in Tables 7.4, 7.5, 7.6, B.7, B.8, B.11, B.12, and B.13. The final EIS must provide a detailed scenario description of the maximum hypothetical transportation accident, a detailed list of major input values (for example, specific values for wind speed at the time of the accident) used in the RISKIND analysis, and a sensitivity analysis demonstrating the significance of key assumptions based on expert judgement rather than on empirical data (for example, assumptions about cask response to extra-regulatory thermal events when no full-scale fire tests have been conducted on the proposed MPC design or the other alternative container systems).

Moreover, the draft EIS focuses only on the public health effects of a hypothetical severe accident involving a release, and completely ignores other important impacts. The final EIS must correct these deficiencies by evaluating the full range of impacts resulting from a release of radioactive materials from: (a) a rail accident in a representative rural area with a local economy based on agriculture and tourism; and, (b) a rail accident in one of the two major urban areas along the likely rail route between INEL and Yucca Mountain (either Salt Lake City or Las Vegas). At a minimum, the consequence analysis must consider the extent of the area contaminated under worst case weather conditions and the level of cleanup required under several varying regulatory scenarios. In addition to health effects, the consequence analysis must address the economic cost of cleanup including opportunity costs, time and personnel requirements for cleanup, and the full range of social impacts, such as the potential for permanent out-migration.

J 5.6 Use of Dedicated Trains

The draft EIS repeatedly states that Naval spent nuclear fuel containers may be shipped in general freight trains. Shipment of spent nuclear fuel in general freight trains is unacceptable for the following reasons:

1) It unacceptably increases the complexity of rail operations. Even if DOE builds a rail spur to the repository or storage site, spent fuel casks in general freight trains would not be delivered directly to these facilities, but would have to be switched out of mixed freight trains at a rail yard or on a siding, raising concerns about safety and physical security until the cask cars were shipped to their ultimate destination;

2) It makes State point-of-entry safety inspections more difficult and more dangerous for railroad personnel and State safety inspectors;

3) It increases the probability of train derailments because mixing large, heavy rail casks in general freight trains could adversely affect train dynamics; and

4) It potentially increases the consequences of any severe accidents that occur, since Naval spent nuclear fuel casks could be shipped on the same trains with a variety of explosive, combustible, toxic, or otherwise hazardous materials.

All shipments to a repository or interim storage facility should be made in dedicated trains, and the final EIS should redo the entire risk and impact analyses in Chapter 7 and Appendix B and assume that all shipments will be made by dedicated train.

K 5.7 Consequences of A Successful Terrorist Attack

The draft EIS ignores the potential consequences of a successful terrorist attack on a shipment of Naval spent nuclear fuel. The final EIS cannot rely upon the inadequate terrorism consequence analyses prepared for DOE and the NRC in the mid-1980s. The final EIS must evaluate a credible range of terrorist attack methods, attack locations/environments, and attack outcomes based on currently proposed shipping container designs and currently available weapons capabilities.

NRC has evaluated and re-evaluated the consequences of terrorist attacks several times during 1970s and 1980s. In 1984, NRC concluded that the cônsequences of terrorist attack with explosives would not be significant in terms of the amount of release (relative to cask contents) or resulting health effects, and subsequently proposed lessened security requirements. Based on experiments sponsored by DOE and NRC, the NRC summarized its findings regarding the estimated release of radioactive materials following a successful terrorist attack using a shaped explosive against a spent fuel shipping cask: "A shipping cask has been subjected to attack by explosive to evaluate cask and spent fuel response to a device 30 times larger in explosive weight than a typical anti-tank weapon. This device would carve an approximately 3-inch-diameter hole through the cask wall and contained spent fuel and is estimated to cause the release of 2/100,000 of the total fuel weight (~10 grams of fuel) in an inhalable form." (U.S. Nuclear Regulatory Commission, Transporting Spent Fuel: Protection Provided Against Severe Highway and Railroad Accidents(March, 1987)).

The NRC's consequence analysis focused on the projected human health effects of such a release of respirable particles of spent fuel. In NRC-sponsored studies, assuming an attack on a truck cask carrying a single PWR fuel assembly, "researchers found that the average radiological consequence of a release in a heavily populated urban area such as New York City would be no early fatalities and less than one (0.4) latent cancer fatality." When more unfavorable circumstances were considered, for example assuming the attack occurred at evening rush hour on a business day in the most unfavorable location for a release, the peak consequence was found to be "no early fatalities and less than three (2.9) latent cancer fatalities." For larger casks containing more fuel, the NRC found that "the upper bound of release would likely increase roughly in proportion to the square root of the total number of assemblies contained in a cask." (For example, the release -and the expected peak consequence- from an attack on an MPC containing 21 civilian PWR assemblies would be about 13 latent cancer fatalities). The NRC concluded: "On the basis of energy release from the explosive, it is expected that the number of fatalities from a sabotage explosion would be greater than the number of radiologically induced fatalities."

The DOE sponsored studies, which included one full-scale and several small-scale experiments, produced similar results. The explosive attack on the full-scale cask containing one fuel assembly was calculated to release a maximum of 17 grams of spent fuel. Researchers calculated peak consequences of a 17 gram release to be "no early fatalities and about 7 latent cancer fatalities." (NRC," Modification of Protection Requirements for Spent Fuel Shipments: Proposed Rule," Federal Register, Vol. 49, No. 112 (June 8, 1984), Pp.23868-23869).

Many comments on the NRC's 1984 proposed rule attacked the NRC methodology and conclusions:

- NRC underestimated the potential damage to cask and spent fuel as result of an attack with explosives;

- NRC underestimated the potential health effects of a release; and

- NRC did not adequately evaluate the economic impacts of an attack resulting in a release of contents.

The final EIS must avoid the inadequacies of the NRC's previous analyses. The final EIS must consider a range of attack methods, such as:

1. Attack cask without capture using one or more rocket-propelled armor piercing weapons;

2. Attack cask after capture using one or more high-energy explosive devices (e.g., military or civilian shaped charges, massive truck bomb);

3. Damage infrastructure to cause accident subjecting cask to catastrophic impacts (e.g., destroy bridge causing truck or train to fall, destroy tunnel causing truck or train to be-crushed, damage track or signals to cause high-speed derailment, blow up fuel storage near tracks or roadway as shipment is passing, etc.).

The final EIS must consider a range of terrorist attack locations, such as:

1. Rural areas near sensitive activities and resources such as farms, ranches, water supplies;

2. Suburban areas near difficult to evacuate activities such as residences, schools, industrial facilities, sports stadiums, etc.;

3. Urban areas, downtown office districts, highway or subway junctions, tourist areas like the Las Vegas Strip;

4. Locations of special events (e.g., the Olympics, major international trade show or convention, national political party convention).

The final EIS must consider a range of terrorist attack outcomes, such as:

1. Cask is breached, contents damaged, radioactive materials released, radiation from loss of shielding;

2. Cask is damaged, no release of radioactive materials, radiation from loss of shielding;

3. Cask is damaged, no release, no loss of shielding;

4. Cask is undamaged (attack fails completely).

The final EIS must consider two aspects of cask design important for a vulnerability assessment:

1. Cask wall materials and thickness : the large MPC transport cask walls are comprised of 4.25" of stainless steel, 1.5 " of depleted uranium, and 0.5" of lead; the MPC canister shell inside the transport cask adds 1.0" of stainless steel; the NACS/T (Nuclear Assurance Corporation Storage/Transportation cask) walls are comprised of 4.1" of stainless steel and 3.7" of lead;

2. Diameter of the cask cavity and overall cask thickness : The large MPC cask cavity is 61.0" in diameter, and the overall cask thickness is about 85"; the NACS/T cask cavity is about 71" in diameter, and the overall thickness is about 96";

The final EIS must consider the armor penetration capability of currently available weapons that could be used to attack a shipping cask. Military weapons guides are readily available in most big city libraries or book stores and provide detailed information on numerous anti-tank missiles and other munitions that could be used against spent fuel shipping casks. One of the best known anti-tank weapons, the Milan missile, illustrates several general characteristics[4] that should be considered in a terrorism risk assessment, including:

- Armor penetration capability : >1000 mm;
- Man-portability: total system weight about 33 kg;
- Long range capability: maximum effective range of 2,000 meters (travel time 12.5 seconds);
- Relative ease of use: sight-on-target, semi-automatic, wire guidance; and
- Relative availability: several tens of thousands have been produced, and it is used by a number of European, Middle Eastern, and Asian armies.

A weapon such as a Milan missile could conceivably penetrate or even perforate a rail cask containing Naval spent nuclear fuel. It therefore represents the type of weapon that should be evaluated in a terrorism risk assessment for Naval spent nuclear fuel transportation to Yucca Mountain.

L

6.0 Environmental Justice

The issue of environmental justice is inadequately addressed in the draft EIS. Apart from a cursory evaluation of effects on the Ft. Hall Indian Reservation in Idaho, no other analyses are provided to examine the impacts of Naval SNF and SCW on Native American communities in Nevada (and elsewhere) along shipping routes. Likewise, the potential for disproportionate impacts to rural communities should be addressed. The final EIS must address environmental justice impacts more fully, and the Record of Decision must specify mitigation measures the Navy is committed to implementing.

The draft EIS makes a number of problematic and/or inaccurate assertions with respect to environmental justice, including "The environmental consequences and impacts on health and safety for the actions described in this EIS would be small for all population groups and therefore, it would be expected that there would be no disproportionately high or adverse impacts to any minority or low-income population" (S.7 - Page S-18), and "Shipping accidents could

[4] Source: Ian V. Hogg, Infantry Support Weapons: Mortars, Missiles and Machine Guns (Greenhill Military Manuals, No. 5), Mechanicsburg, PA: Stackpole Books, 1.

occur at any location along the routes used, so it is not possible to identify the specific impact on the minority or low-income composition of the populations along the routes" (7.3.5 - Page 7-10).

Since the draft EIS notes that, for the most direct representative rail transportation route to Yucca Mountain, 93% of the distance is rural, and 5.8% is suburban, (and equivalent information is provided in Table B.15 for two alternate routes), it is possible to analyze the populations along the routes as to their minority or low-income status. This should be done as it was for potential cask fabrication locations.

Probabilities of accidents at locations in which minorities or low-income populations occur can be calculated from location-specific (rather than national average) experience records to evaluate if there are disproportionate accident risks involved. Several hypothetical accident scenarios (involving a range of meteorological conditions because of the locations of the 3 routes) can be evaluated and compared to other locations along the rail lines as to their potential impact (both radiological and non-radiological), given that traffic safety facilities and emergency preparedness and management capabilities are generally less developed in rural areas, especially those populated by minority or low-income communities. Evaluations such as these, especially focused on Native American lands and sparely populated rural counties and communities, should be carried out in order to support any conclusions in the final EIS regarding whether disproportionate impacts are present or not, and whether mitigation actions would be appropriate.

The conclusions of the draft EIS, as quoted above, are insufficiently supported in the draft EIS to satisfy either the information needs of the EIS or the requirements of an Environmental Justice evaluation.

M 7.0 Socioeconomic Analyses

The treatment of possible socioeconomic effects of Naval spent nuclear fuel for all of the alternatives evaluated in the draft EIS involving handling, storage, transport, and disposal of nuclear materials is inadequate (ref. Sections 5.5, 6.0, 7.3). When any analysis is done, it focuses solely on those impacts that are driven by employment and population increases resulting from various alternatives, and then does so only with respect to their potentially positive contributions to local economics. What the draft EIS fails to assess, and what should be included in the final EIS if economic and other impacts to affected jurisdictions are to be adequately evaluated, are the implications of the potential stigmatizing effects of various nuclear-related activities (i.e., handling and storage at INEL; transportation of spent fuel through states and communities; and handling and storage/disposal at a repository or interim storage facility).

Research conducted by the State of Nevada has demonstrated convincingly that nuclear-related activities (i.e., storage facilities, radioactive materials transportation, etc.) have the potential to result in significant socioeconomic impacts at all levels within the state, from the local communities to the state government. These effects originate in intense negative perceptions and avoidance behaviors by the public in response to nuclear facilities/activities which could produce large negative impacts. While such impacts would likely be most pronounced and more likely to occur in Idaho and Nevada (the "representative or notional" location used for the repository and interim storage site), they could occur within any state or community along potential shipping routes.[5] Such impacts could occur in the course of routine operations if public reaction to the facilities or to the transportation of nuclear materials is such that significant negative attention is brought to such operations. In the event of accidents involving spent nuclear fuel or other nuclear materials, the potential for significant impacts would be much greater. This can be the case even if no radiological materials are released, when the accident draws wide media attention. In the case of an accident involving a release, the occurrence of stigmatizing impacts is almost a certainty - the only question being the extent of the negative effects and their duration.

In Nevada, the potential for stigma-related impacts is magnified by the state's unique vulnerability to any change in its public image.[6] The great public and media interest in things nuclear makes it almost certain that any association with negative "nuclear" perceptions could adversely affect Nevada's attempts to attract tourists, conventions, migrants, and new business investments to some degree. This could be especially troublesome in the event of a nuclear waste accident in or near Las Vegas, one of the world's major tourist destinations and the dominant contributor to Nevada's economy and tax revenues. While there is considerable uncertainty about the federal government's ability to manage radioactive materials safely and about future public responses to accidents and events, it is clear that over the last half century the public has developed a very strong negative aversion to such wastes and the facilities associated with them. The conclusion of the Nevada researchers who have studied the issue is that, under certain circumstances, stigma impacts could be very negative and very large.

The existing research on stigma effects and potential impacts provides a viable theoretical and methodological base so that the Navy should be able to provide an assessment of these types

[5] The Winter Olympics will be held in Salt Lake City in 2002 at a time when, under provisions of legislation now before Congress, spent fuel shipments to an interim storage facility could be occurring. Under such circumstances, Salt Lake City and Utah could be especially vulnerable to stigmatizing effects of Naval spent fuel transportation accidents.

[6] Nevada is unique among all of the states because of its extraordinary reliance on tourism as the source of revenue for all aspects of state and local government operations. As such, Nevada's public image as an attractive tourist destination is crucial to the state's economic well-being. Changes in that image will have direct economic and other consequences.

of impacts on the economy, public revenues, public services, and community quality of life for Idaho, Nevada, and states/communities located along likely transportation corridors.[7] It is very possible that, through the social amplification of risk process, even relatively minor events or accidents could have serious economic consequences that, in the case of Idaho and Nevada, could dwarf any expected benefits to be derived from employment and spending associated with Naval spent fuel activities.

The fact that Naval spent fuel and Special Case Waste represent a small percentage of the total volume of spent fuel and high-level radioactive wastes that would be transported to and stored/disposed of at an interim storage facility or repository does not absolve the Navy from the responsibility to adequately assess potential socioeconomic and other impacts. It is inappropriate and unacceptable to state, as the draft EIS does in several places, that impacts will be small because the Navy's contribution to the overall spent fuel/waste stream is so small. There will be instances where Naval spent fuel and SCW will be the principal contributors to impacts (i.e., in Idaho and along the likely shipping route from Idaho to Utah). In addition, the fact that DOE has chosen to piecemeal the EIS process by not preparing a programmatic EIS for the range of activities contemplated under the Nuclear Waste Policy Act means that the Navy must prepare an EIS for its activities that adequately evaluates the potential for impacts resulting from the types of materials and operations contemplated. The analysis of cumulative impacts should then examine the contribution of the Navy's activities to DOE's larger program. It is possible that the Navy's activities could significantly increase the overall risks and impacts in certain geographic areas.[8]

N 8.0 Waste Acceptance

The draft EIS makes some questionable assumptions about the fundamental issue of disposal of Naval spent fuel and Special Case Waste in a repository, including the assumption that, "The Nuclear Waste Policy Act authorizes disposal of spent nuclear fuel, including naval spent nuclear fuel, in a geologic repository"(S.1 on Page S-1) and the related assumption that, "The Yucca Mountain site is the only site currently authorized by legislation, specifically the

[7] A detailed summary of the State of Nevada research can be found in the publication, "State of Nevada Socioeconomic Studies of Yucca Mountain 1986 - 1992: An Annotated Guide and Research Summary," NWPO-SE-056-93 (June, 1993). See also "State of Nevada Socioeconomic Studies Biannual Report, 1993-1995," by James Flynn, et. al. (July, 1995).

[8] In Salt Lake City, for example, Naval spent fuel shipments could add significantly to the volume of total spent fuel shipments and expand the number of shipping routes with which the city and surrounding communities will have to contend.

Nuclear Waste Policy Act, for site characterization as a geologic repository for spent nuclear fuel, including naval spent nuclear fuel" (1.0 on Page 1-1).

It is not clear that the Nuclear Waste Policy Act authorizes the disposal of Naval spent nuclear fuel in the proposed geologic repository. Rather, it appears that the Act does not contemplate the need for disposal of spent nuclear fuel from atomic energy defense activities. The authority for disposal in a repository of spent nuclear fuel from atomic energy defense activities, including Naval spent nuclear fuel, should be provided either in future legislation, or preferably, by rule of the Nuclear Regulatory Commission, as provided in Sec. 2, Paragraph (12)(B) [42 USC 10101] of the Nuclear Waste Policy Act.

Notwithstanding the definition of "spent nuclear fuel" in Section 2 [42 USC 10101] of the Nuclear Waste Policy Act, Sec. 8 [42 USC 10107] contemplates that all relevant nuclear waste from atomic energy defense activities will be "high-level radioactive waste" for purposes of a Presidential decision regarding co-mingling of civilian and defense wastes in a repository.

The question of authority regarding disposal of Naval spent nuclear fuel is an important one since, as will be discussed later in these comments, Naval spent nuclear fuel has significantly different characteristics from commercial spent nuclear fuel. And, if the Naval spent fuel is intended to be disposed in a repository along with commercial spent fuel under license from the Nuclear Regulatory Commission, it could be important to safety to have regulatory authorization for this activity that is responsive not only to the differing characteristics of the Naval spent fuel, but also to the likelihood that some details of these characteristics will be classified for national security purposes and not available to all participants in the repository licensing proceeding.

O 9.0 Waste Characteristics

There will be specific waste acceptance criteria for receipt of all spent nuclear fuel, and potentially Special Case and Greater-Than-Class-C Waste at a repository or interim storage site. These criteria will be established by the Office of Civilian Radioactive Waste Management prior to operation of the facilities. While the criteria have not yet been set, it is clear that meeting any waste acceptance criteria will rely heavily on acceptable records and verification of the characteristics of the waste in each container received. The records required for acceptance will vary not only with the range of waste characteristics, but with the alternative containers because of their differing capacities.

The draft EIS, in its discussion of spent fuel and Special Case Waste characteristics (Section 2.3 on Pages 2-3, 2-4 and Appendix E), should describe the range of waste characteristics that exists in the inventory that will be placed in any of the alternative containers, e.g., physical dimensions, physical condition, radiological characteristics, thermal output, radiological output, burn-up, initial enrichment, age out of reactor, etc. The draft EIS should describe the records kept of these characteristics, and the means and procedures that will be used to validate these records at the time of container loading, for purposes of waste acceptance.

It is not enough for the draft EIS to defer this matter to the Nuclear Regulatory Commission's container certification process, as suggested on page 2-4. The issue is of much greater dimension, if the Naval nuclear waste is to be accepted into a storage and disposal system regulated by the requirements of the Nuclear Regulatory Commission and open to public scrutiny. The final EIS must include this crucial waste acceptance issue and all its requirements as currently understood in its considerations, rather than assume that the wastes will be accepted as presented.

If the specifics of the waste characteristics cannot be fully revealed in a public final EIS for national security reasons, this information should be included in a classified appendix for review by appropriately cleared reviewers.

Strict adherence to waste acceptance criteria is important to Nevada, in that it is a fundamental component of repository performance assessment and safety. It describes the source term for the repository. Therefore, it is imperative that the characteristics of the contents of each container be known through validated records, to which the acceptance criteria can be applied. It is not sufficient nor acceptable for the draft EIS to say, and imply, that the Naval nuclear wastes exist in such small amounts that the impacts of waste management and disposal, when compared with the impacts from all spent nuclear fuel in the waste management system, are insignificant. Instead, the extent of their significance must first be determined though the analysis of validated documentation of the waste characteristics.

For example, the final EIS must evaluate specifically the implications of Naval spent fuel characteristics within the context of the explosive autocatalytic criticality theory put forth by scientists at Los Alamos National Laboratory [Ref. C.D. Bowman and F. Venneri, "Underground Autocatalytic Criticality From Plutonium and Other Fissile Material," (LA-UR-94-4022)]. The Bowman-Venneri theory postulates a situation at a Yucca Mountain repository where subcritical fissile material could reach criticality that is self-enhancing, resulting in a potentially explosive breach of repository integrity. The draft EIS should evaluate the likelihood that the unique characteristics of Naval spent fuel could contribute to the risks of such an occurrence subsequent to disposal in a repository.

10.0 Environmental Impacts and Analyses

P

10.1 Programmatic Environmental Impact Analysis

Nowhere in the Navy's draft EIS for spent nuclear fuel is there mention of how programmatic impacts for all the nuclear waste in a geologic repository will be addressed. This raises the combined issues of cumulative impacts, connected actions, and segmented, piecemeal analysis where an integrated programmatic analysis and assessment is called for. For example, 40 CFR 1508.25 states that an agency should analyze "connected actions" in one EIS. The Council on Environmental Quality (CEQ)regulations are directed at avoiding improper segmentation, wherein the significance of the environmental impacts of an action as a whole would not be evident if the action were to be broken into component parts and the impacts of those parts analyzed separately.

The Navy's final EIS must address this matter with respect to the disconnected impact assessments between the Navy spent nuclear fuel, a geologic repository, and the disposal of all additional nuclear waste as proposed by the Department of Energy. How the Navy's nuclear waste will be integrated into the whole process is especially important with respect to such issues as groundwater, past testing of nuclear weapons, and other relevant programs such as environmental restoration programs that doubtlessly will apply to any final repository site.

While it is true that a final site for a repository has not been formally designated, the Navy is beholden to NEPA and the public to address the full spectrum of potential environmental and health consequences arising from the Navy's spent nuclear fuel. Because a repository site has not been selected does not mean that the Navy is free of the responsibility for preparing a comprehensive EIS in a programmatic manner [cf. CEQ's 40 CFR 1508(b)(3) and DOE's 10 CFR 1021.330]. Therefore, instead of proceeding with the current draft EIS, the Navy should join with DOE to prepare a programmatic EIS for all the spent nuclear fuel to be disposed of in a geologic repository. From that document, specific actions should be tiered pursuant to the NEPA regulations.

Q 10.2 Environmental Life Cycle Assessment

Environmental life cycle assessment is an approach that analyzes the entire system around waste disposal. Applied to Navy spent nuclear fuel, it would encompass raw materials used for manufacturing nuclear waste canisters and transporting the waste to a repository, as well as repository construction, operation, closure, and future outcome. All the downstream and upstream effects of the operation of waste disposal would be factored into the environmental impact assessment to provide a comprehensive view of the full spectrum of environmental consequences associated with the proposed action.

In Sections S.3 and 3.8, the draft EIS addresses canister manufacturing impacts in partial terms of the life cycle assessment process. However, the words "life cycle assessment" are never used and the concept itself is not articulated. As a consequence, the concept of life cycle assessment appears inadequately understood and applied in the draft EIS. Especially for Tables S.1 and 3.5 and the associated text, the concept of raw material extraction and ultimate disposal of all wastes, including the long-term fate of the canisters, needs to be clearly expressed. Then, the concept should be woven throughout the document.

To achieve this, there are two U.S. Environmental Protection Agency documents that should be used. These were issued to encourage waste management activities to apply life cycle assessment to environmental protection:

- Life Cycle Design Guidance Manual, EPA/600/R-92/226, January 1993.

- Life-Cycle Assessment: Guidelines and Principles, EPA/600/R-92/245, February 1993.

The documents should guide the Navy's application of the life cycle assessment process. In so doing, a departure away from the present piecemeal, compartmentalized approach to the NEPA process can be reflected in the final EIS.

Such a procedure should be accomplished by integrating impact assessment into a systems engineering program for the canisters and ultimate waste disposal. This would permit a systems engineering analysis to address alternatives within the project that would allow the best environmental decisions to be made to the benefit of the comprehensive repository program. To this end, the EIS should be based on a framework for environmental life-cycle assessment that would assure environmental decision making in the full long-term context implied by the Navy spent nuclear fuel program.

Environmental life cycle assessment is consistent with the tenants of ecosystem management which the White House has instructed federal agencies to adopt as the basis for protecting public interest regarding natural resources. The Navy has joined the Army, the Air Force, the Department of Defense, the Department of Energy, and other federal agencies in this approach to resource stewardship, and this should be reflected in the final EIS. (See, for example, White House Office of Environmental Policy Interagency Ecosystem Management Task Force, ***The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies***, Vols. I-III, June 1995, and Department of Energy, ***Stewards of a National Resource***, DOE/FM-0002, 1995.)

R 10.3 Impact Assessment

While Sections S.4 through S.8 and Chapters 1 through 7 of the draft EIS discuss various aspects of impact assessment, the document does not identify accepted methods for assessing environmental impacts. An appendix that discusses the impact assessment methods, assumptions, and steps in the process as well as the results of each step should be added to the document. In other words, an accepted environmental assessment methodology and approach should be adopted and documented for the EIS. An example that could be used is:

Jain, R., L. Urban, G. Stacey, and H. Balbach. 1993. ***Environmental Assessment.*** McGraw-Hill, Inc., New York, 526 pp.

S 10.3.1 Environmental Risk Analysis

Central to NEPA is the ability to make predictions about environmental outcomes resulting from alternative courses of action such as those presented in the draft EIS. The soundness of decision making is dependent on this predictive capability. In turn, the fitness of the very long-term predictions, such as the ones posed by nuclear spent fuel, depends on the inclusiveness, representativeness, and explanatory power of simulation models derived from sound empirical information. Gaps in knowledge and uncertainties should be eliminated wherever possible. Decision making, on the other hand, like that under NEPA, should be based on best practicable methodology, i.e., environmental risk analysis. The extent of uncertainty that can be tolerated in risk assessment for disposing of spent nuclear fuel and that is unlikely to be resolved must be made clear in the Navy's final EIS (**cf. *The Environmental Professional* 15: 1-160, 1993** and ***The Environmental Professional*** **18: 1-235, 1996**).

The steps in such a risk-based approach are for the Navy to (a) define the end point conditions that must be protected, (b) characterize the long-term environment that might exist, and (c) assess the full spectrum of environmental hazards that could result from spent nuclear fuel to the long-term health of future generations and their environment. The extensive uncertainty that presently exists in all three steps can be reduced only by empirical scientific studies. Any effort to resolve the uncertainties by subjective opinion, as is frequently resorted to, will be unsatisfactory.

T 10.3.2 Cumulative Impact Analysis

References should be included in the final EIS regarding the methods used for analyzing cumulative impacts. Otherwise, the analyses will appear not to be empirically based. It is likely in the Navy's routine NEPA compliance process that cumulative impacts (40 CFR 1508.7) typically are ignored or brushed aside with cursory personal opinion that such effects will not occur. In this case, the potential for long-term radiation health impacts from spent nuclear fuel means that the Navy's final EIS must address cumulative effects supported at least by generic or programmatic scientific data and analysis.

U 10.3.3 Human Health Risks and Safety Impacts Study

The Navy's final EIS should include a detailed appendix that provides the approach used for estimating human health consequences, both near term and long term. The risk assessment process should follow identified contaminants from the point of origin along various pathways to humans. Transport mechanisms to humans should include air, water, soil, and food. There is no acknowledgment of the fact that transport of nuclear waste contaminants eventually will occur in ecosystems and that understanding the transport mechanisms ultimately must occur. This is a conceptual deficiency that the Navy's final EIS must resolve. The inability of the EIS to address realistic environmental scenarios and contaminant pathways to humans constitutes a significant flaw in the Navy's NEPA compliance process.

Care should be taken in the final EIS to assure that readers comprehend the uncertainty associated with the findings and conclusions that lack logically supported and credible scientific bases. Thus, it is necessary that the final EIS be grounded in sound approaches to environmental health risk assessment and should, for example, be based on methodologies such as:

Kolluru, R., S. Bartell, R. Pitblado, and S. Stricoff. 1996. ***Risk Assessment and Management Handbook for Environmental, Health, and Safety Professionals***, McGraw-Hill, Inc. New York. 641 pp., and

Calabrese, E. and L. Baldwin. 1993. ***Performing Ecological Risk Assessments***. Lewis Publishers, Boca Raton, FL.

V 10.3.4 Succeeding (Future) Generations

The Navy's draft EIS reflects little attention to measures for protecting the environment for future generations where, aside from such concerns as transportation accidents, most of the threat posed by geologic disposal of spent nuclear fuel lies. Long-term cumulative impacts to the environment and therefore to humans pose a serious threat and are a "truly significant" issue that the Navy's NEPA compliance process must address. The undeniable knowledge that such consequences will someday materialize poses a conflict with NEPA's mandate that each generation be a trustee of the environment for succeeding generations. The Navy must confront this issue and set forth the means for resolving it in the final EIS.

W 10.3.5 Truly Significant, Reasonably Foreseeable Long-Term Impacts

With respect to NEPA, potential adverse environmental and health consequences are associated with the "truly significant" issue (40 CFR 1500.1) of "reasonably foreseeable" long-term (10^6 years) impacts (40 CFR 1502.22) of nuclear waste canisters and the Navy spent nuclear fuel. This concern arises regarding environmental resources like groundwater for future generations. Thus, in keeping with NEPA's mandate for creating environmental and ecological knowledge, the Navy is challenged to show how environmental analysis and assessment procedures can address such concerns as long-term repository performance. The information needed to meet the challenge of scientific integrity (40 CFR 1502.24) and to assess significance (40 CFR 1508.27) will have to be empirical, quantitative, and available within the period to be allocated for comprehensive, integrated environmental impact assessment for nuclear waste disposal that includes the Navy spent nuclear fuel. The challenge cannot be met with the traditional application of subjective expert judgement to environmental impact assessment in cases of unavailable information (40 CFR 1508.22). Plans for resolving this issue in a manner that withstands independent expert peer review should be presented in the final EIS.

X 10.4 Post-project Monitoring

The Navy spent nuclear fuel program must demonstrate how environmental monitoring meant to detect significant adverse impacts will be performed. Monitoring must be initiated in sufficient time for a pre-disturbance baseline of data to be established for comparison with post-project monitoring data. Thus, the final EIS should describe how environmental monitoring will provide the opportunity to address long-term issues of nuclear waste repository performance. Additionally, the document should explain how the environmental simulation modeling necessary for predicting long-term impacts will be carried out.

Y 10.5 Policy and Guidance for NEPA and Regulatory Compliance

The final EIS must list and discuss the policies and guidance followed to achieve NEPA compliance. For compliance with routine media-based environmental regulatory requirements, a statement in the EIS that the proposed action would be in compliance with applicable regulations and DOE Orders will not substitute for a presentation of impacts regarding the materials and the environmental media involved. In this respect, the whole is greater than the sum of the parts with respect to how ecosystem-based environmental assessment should be conducted. Thus, credible and responsible NEPA compliance requires a holistic approach whereas media-based environmental regulations address only restricted components of the environment.

Z 11.0 Relationship Between the Navy Activities and Other Related Activities/Commitments

The draft EIS relies heavily on the agreement between DOE, the Navy, and the State of Idaho in establishing the planning framework upon which the EIS is based. The final EIS must address the potential conflicts between DOE's agreement with Idaho and its agreements with utility companies regarding waste acceptance. If DOE's utility agreements take precedent, the Navy could be required to store SNF and SCW at INEL for a much longer period, and this, in turn, could have implications for a preferred alternative (i.e., the suitability of the canister system as a longer term on-site storage system).

Since DOE is a cooperating agency in the development of the Navy EIS, and since the decision made via the Navy EIS process will impact waste disposal or storage at Yucca Mountain (if that program goes forward), the final EIS should discuss how the Navy's EIS can be "tiered" to DOE's Yucca Mountain EIS so that the impacts of Naval reactor spent fuel on Yucca Mountain can be integrated and assessed.

A A 12.0 Special Case Waste (SCW)

The NEPA compliance strategy for the management and disposition of both Navy and non-Navy Special Case Waste should be discussed or otherwise clarified in the Navy's final EIS. While officials in Nevada are aware that DOE-generated SCW has been disposed of at the Nevada Test Site and that similar wastes classified as Greater-Than-Class-C (GTCC) are being stored at the Idaho Engineering Laboratory, DOE has never conducted either a programmatic or a site-specific NEPA analysis for the management and disposition of these waste types.

This is significant, since DOE has indicated that it will initiate a programmatic analysis at the weapons complex level that will focus on alternative storage and disposition strategies for DOE-generated SCW as well as commercial waste classified as GTCC. Nevada officials understand that alternatives for storage and disposal of DOE's SCW, along with GTCC waste, will be evaluated in a forthcoming Supplemental Environmental Impact Statement tiered from DOE's Waste Management Programmatic EIS.[9] If this, indeed, is the case, DOE has appropriately committed to a program evaluation for the management and disposition of these wastes, and by doing so, the agency will be in compliance with requisite Council of Environmental Quality and DOE Departmental NEPA implementing regulations.[10]

As the Navy is aware, SCW is not currently authorized for disposal in a federal repository. Therefore, conducting an analysis which proposes transporting Navy-generated SCW to Yucca Mountain for either interim storage or disposal is contrary to the spirit and intent of the National Environmental Policy Act, even if such an analysis is "strictly for purposes of evaluation." In fact, there is no need to conduct this analysis in advance of a forthcoming programmatic NEPA evaluation, and by doing so, the Navy could prejudice pending decisions or

[9] See Notice of Inquiry: Strategy for Management and Disposal of Greater-Than-Class-C Low-Level Radioactive Waste, Federal Register Notice, Vol. 60, No. 48, Monday, March 13, 1995; and DOE Draft Waste Management PEIS [DOE/EIS0200d] Volume I. Page 1-16 and 1-17.

[10] 10 CFR 1020.330 and 40 CFR 1508.18(b)(3)

otherwise predetermine subsequent developments which could limit future alternative considerations for the disposition of this waste.[11]

With regard to storage of Navy-generated SCW, State officials believe the EIS should not only evaluate a long-term dry storage system (e.g., MPC), but also a co-located storage program for both Navy-generated SCW and DOE-managed GTCC waste at INEL. This is important since INEL is now charged with management responsibilities for commercially-generated GTCC waste.[12] Accordingly, the Navy should insist that DOE conduct a supplemental analysis of the Idaho Programmatic EIS (DOE/EIS-0203-F) to address co-location and storage of these waste types at a single facility, pending a final disposition strategy. After all, these wastes types are the federal government's responsibility[13] and, because of their similarities[14], they should be managed accordingly.

A B 13.0 Off-Site Generated Radioactive Wastes

A review of the existing public land orders that established the NTS clearly show that the site was not established to serve as a waste disposal facility for off-site generated radioactive wastes. In fact, the State's long standing position is that "the only action appropriately described as no action [e.g., currently permitted activities] at the NTS includes only national defense and nuclear weapons testing activities defined under the public land orders as consented to by the State of Nevada for the NTS withdrawal."[15] Accordingly, any proposed action in a NEPA document developed by a federal agency that is in conflict with the stated purposes and

[11] 40 CFR 1506.1(a); 1506.1©

[12] See U.S. Department of Energy, Record of Decision. Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs, May 30, 1995, Section 3.2.2.5.

[13] Atomic Energy Act (PL 83-703), and the Low-Level Radioactive Waste Policy Amendments Act of 1985 (PL 99-240)

[14] Generally speaking, both GTCC waste and SCW are long-lived and contain significant concentrations of radionuclides. They represent a significant threat to human health and the environment and have been determined to be unsuitable for shallow land burial.. As such, these wastes like the Navy's non-fuel bearing zirconium metal structures (SCW) must be isolated from the biosphere for thousands of years.

[15] Nevada Department of Administration, May 3, 1996. State of Nevada Comments on The Department of Energy's Draft Environmental Impact Statement for the Nevada Test Site and Off-Site Locations Comment Summary.

limitation of the NTS withdrawal must address the "environmental consequences" of such conflicts.[16]

[16] See 40 CFR 1502.16(c)

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Response to Comments:

A. Cover Letter

The commenter expresses the position that the EIS should be limited to the selection of a container system to meet the exclusive need for on-site transportation and interim storage of naval fuel at the Idaho National Engineering Laboratory.

The proposed action of this EIS does not entail actual shipment to a repository or a centralized interim storage site. Rather such a shipment to a notional repository or centralized interim storage site is evaluated to help distinguish among the six container alternatives. As stated in the EIS, the proposed action is the selection of a container system for the management of post-examination naval spent nuclear fuel and Navy-generated special case waste. The proposed action also includes:

- Manufacturing the container system.
- Loading, handling and storage of the container system at Idaho National Engineering Laboratory.
- Modifications to the Expended Core Facility and the Idaho Chemical Processing Plant at Idaho National Engineering Laboratory to support loading the containers at Idaho National Engineering Laboratory.
- Selection of the location of the dry storage area at Idaho National Engineering Laboratory.
- Evaluating the impacts of transporting the container system to a representative or notional interim storage facility or repository and unloading the container system at that hypothetical location.

In evaluating alternatives for such a system, it is incumbent upon the Navy under the National Environmental Policy Act to evaluate how the system affects ultimate transport to an interim storage facility or repository, since such action is reasonably foreseeable. Including the impacts of transporting the container system to, and unloading at, a representative or notional interim storage facility or repository ensures that the container system selected is compatible with these operations at the facilities to the extent they are understood at this time. The location of the facilities is not known at this time and waste acceptance criteria have not yet been established. The site for a geologic repository or centralized interim storage facility is neither a decision which the Navy will make nor a matter covered under this EIS. Likewise, the routes for transporting loaded containers to that specific location are not selected by the Navy. For the former, further National Environmental Policy Act evaluation will be needed in site-specific environmental documentation for an interim storage facility or repository when the specific location is established. A possible location (Yucca Mountain) has been included in this EIS only for transportation analysis purposes, since it is the only location identified for characterization in the Nuclear Waste Policy Act. Routes to Yucca Mountain, as examples, were chosen with different distances and through areas having different population densities to identify whether different routes or different population densities would have a significant impact on the container system selection. They did not. Since the impacts of transporting to and unloading at this representative or notional location are shown to be small, and little difference exists among the alternate containers evaluated, this enables the Navy to select a container system now, taking these factors into account in the most reasonable and appropriate fashion.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
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B. 1.0 Preferred Action Alternative

The commenter observed that the Draft EIS does not contain a preferred alternative. He is correct. However, National Environmental Policy Act regulations (40 CFR 1502.14(e)) only state that the Draft EIS should include a preferred alternative if one exists. None is identified since the Navy did not have a preferred alternative at the time the Draft EIS was issued. The regulations further require that a preferred alternative be included in the Final EIS; one is identified in Chapter 3, Section 3.9 of the Final EIS.

The Draft EIS contains six alternate container systems. Each of the six systems has been evaluated for loading at Idaho National Engineering Laboratory, dry storage at Idaho National Engineering Laboratory, loading for shipment, and shipment outside the state of Idaho to a representative or notional repository and unloading at that hypothetical location consistent with the proposed action as it is described in Chapter 1. The systems have some similarities, but many differences.

All six of the container systems are practical for use in managing naval spent nuclear fuel and special case waste. The differences in environmental impacts among the six systems are small.

The commenter stated that the EIS is not adequate to support decisions regarding off-site transportation and waste disposal. This EIS is not intended to make decisions regarding off-site transportation or waste disposal. Thus this comment is beyond the scope of this EIS. Evaluation of the impacts of off-site transportation and unloading at a representative or notional interim storage facility or repository are included only to determine if off-site transportation or unloading operations could significantly affect the selection of the container system. In view of the small magnitude of the impacts and the small differences among the alternatives due to off-site transportation and unloading, the EIS adequately supports a decision regarding the selection of a container system.

Until an interim storage facility or repository is identified, the container system selected will be used only on-site at Idaho National Engineering Laboratory. However, the National Environmental Policy Act requires that the EIS estimate whether impacts from other operations, which are not yet ripe for decision, but are reasonably foreseeable, may significantly influence the selection of a container system. Before the container system would actually be used for off-site transportation to, and unloading at, an interim storage facility or repository, the location of these facilities must be identified and appropriate environmental documentation completed as discussed in the Executive Summary, Section S.1 of the EIS. This documentation would include transportation to these facilities and unloading and management of container systems at these facilities.

It is desirable, but not essential, that canister designs, such as a multi-purpose canister, be put into disposal "overpacks" when they arrive at the repository without needing to unload the contents. When an overpack is used, the combination of the overpack, the canister and the waste package contents then would be required to meet the repository requirements. Alternately, the contents of the canister may be unloaded at the repository and the contents placed into a disposal container. Both operations were evaluated in the EIS to see if there are any significant differences that may affect the selection of the container system. No significant differences were identified. Thus, there is no need to delay selection of the container system pending further information on the interim storage site or repository location, and indeed such a delay is unacceptable owing to the Navy's obligations under the court-ordered Idaho agreement to proceed with dry containerization and storage of naval spent nuclear fuel.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

C. 2.0 Public Participation

The commenter claimed that since no public hearings were held in Nevada, the Navy's public involvement/participation process for the EIS was not adequate to provide opportunities for public involvement in Nevada and in states/communities along the referenced shipping routes.

The public involvement/participation process for this EIS meets applicable requirements. Over 1,600 copies of the Draft EIS and EIS Executive Summary were mailed to interested members of the public as well as federal, state, tribal, and local agencies. The Draft EIS was placed in 43 public reading rooms and libraries spread throughout the western states and numerous advertisements were placed in local newspapers announcing the availability of the Draft EIS for public review and comment. In addition, six public hearings were held at three locations (Boise, Idaho Falls area, and Salt Lake City) in Idaho and Utah. The locations selected covered those regions where naval spent nuclear fuel will be loaded and stored, and a large urban area along a possible transportation route. These locations are consistent with the proposed action covered in the Container System EIS. The EIS does not lead to selection of a centralized interim storage site or a site for ultimate disposal of spent fuel, since those matters are under the cognizance of the Department of Energy. The EIS does analyze shipment to Yucca Mountain, but for analytical purposes of comparing alternate container systems only, recognizing that location as the only one authorized under the Nuclear Waste Policy Act for evaluation as a potential repository. The analysis does not presume, however, that Yucca Mountain will be found suitable as a repository.

The actual routes to be used for shipment of naval spent nuclear fuel to a repository will be evaluated along with other routes to be used for a geologic repository or centralized interim storage facility in the site specific EIS for such a facility. The evaluation of the environmental impacts due to transportation of naval spent nuclear fuel in this EIS was performed in part to determine whether or not there were any differences among the six container system alternatives. In order to perform the analysis, a notional destination had to be selected. In addition, three routes were evaluated to identify a range of potential impacts to see if that would produce differences among the alternate container systems. As the summary in Chapter 7, Section 7.3 states, the environmental impacts are very small in each case and the differences among the container system alternatives are negligible. The analysis suggests that a similar conclusion would be reached for any destination located away from populated areas. The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses.

D. 3.0 Overall Level of Information

The level of information in the Container System EIS is sufficient; a classified appendix is not necessary. Although the detailed design of Navy fuel is classified, the EIS contains significant information concerning its performance characteristics and the contents of the loaded container systems such that the environmental impacts from its shipment, storage, and management can be assessed and independent analyses can be performed to verify the results presented in this EIS. Chapter 2, Section 2.3 of the EIS presents the general characteristics of naval nuclear fuel, including design description, U-235 enrichment range, the amount of U-235 in a loaded container, criticality control measures, and the results of decay heat calculations. Appendices A and B contain detailed numerical data on the source terms and on corrosion product and fission product releases expected for each container system for each hypothetical accident scenario analyzed. The Appendices also identify the computer programs which were used, along with the specific assumptions for each accident scenario.

For example, Appendix B, Table B.8 provides a list of the radioactive nuclides which might be released in a shipping accident involving naval spent nuclear fuel. The data on the amount of radioactivity are divided into the amounts released from the fission products in the fuel and the amount in the activated corrosion products attached to the surface of the fuel. The data are provided for typical spent fuel in nuclear-powered submarine and surface ship fuel assemblies to demonstrate the range of radioactivity. Using the information in this table, along with the other detailed information on the calculations provided in Appendix B, allows independent reviewers to evaluate the adequacy of the calculation of impacts of a hypothetical accident on human health and the environment. It also permits an independent reviewer to perform analyses using alternate methods, such as other computer programs, or utilizing other conditions, such as different weather or accident conditions. The information in Appendix A, including the amount of radioactivity released and the fraction of the total activity in naval spent nuclear fuel it represents, is provided in similar detail to permit independent analyses for normal and accident conditions.

The Navy has provided in this EIS, and in documents referenced in the EIS, a substantial amount of information on the handling, storage, and shipment of naval spent nuclear fuel and the types and amounts of radiation or radioactive material involved in releases from normal operations and postulated accidents in this EIS. The Navy has attempted to provide enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

E. 4.0 Worse Case Accidents

Accident analyses performed for this EIS meet applicable requirements. Appendices A and B, Section A.2.5 and Sections B.5 and B.6 provide detailed descriptions of analysis for the most severe reasonably foreseeable accidents which might occur during handling, storage or shipment of naval spent nuclear fuel. The analyses described in this EIS include the risks and impacts from low probability events. Accidents with a probability of occurring greater than 10^{-7} per year, i.e., with a chance of one in ten million per year, are described and analyzed in Appendices A and B and the results are included in the discussions in the Executive Summary and Chapters 5, 6, and 7. Section A.2.2, Screening/Selection of Accidents for Detailed Examination, and the discussion on Categorization of Accidents (in Section A.2.3) present the details of the approach taken for facility accidents. Accidents which are less likely than 10^{-7} per year are considered to be incredible (i.e. not reasonably foreseeable) and typically are not discussed since they are not expected to contribute in any substantial way to the risk. This is consistent with guidance developed by other federal agencies, including the DOE, for facility accident analysis.

Detailed descriptions and tabulations of the amount of radioactivity which might be released by hypothetical accidents are provided in Appendices A and B. The data in these Appendices provide numerical values for the sources of radiation and radioactivity which allow an independent calculation of the effects on human health and the environment using the same or different conditions.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Sections A.2.7 and B.3.4 state that an analysis of uncertainties concludes that the estimates of risk provided in the EIS are unlikely to be exceeded during either normal operations or in the event of an accident. The models used have attempted to provide estimates of the probabilities, source terms, pathways for dispersion and exposure, and the effects on human health and the environment which are as accurate as possible. However, in many cases, the Navy has used models or values for input which produce estimates of consequences and risks which are higher than would actually occur because of the desire to provide results which will not be exceeded. In summary, the risks presented in this EIS are believed to be at least 10 to 100 times larger than would actually occur.

The use of conservative analyses does not bias the analysis in the EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are very small.

F. 5.0 Overall Transportation Analysis

A range of routes to a repository or centralized interim storage site is used for the transportation analysis in order to determine whether different routing characteristics, such as distance or differences in population distribution, would affect the comparison of the alternative container types. Since no repository or centralized interim storage site has yet been selected, the transportation routing in this EIS uses a site being evaluated by the Department of Energy pursuant to the Nuclear Waste Policy Act as the destination point for naval spent nuclear fuel shipments.

The Navy recognizes that the legal and regulatory climate is changing on nuclear waste transportation matters and is keeping abreast of the requirements. From the historical perspective, naval spent nuclear fuel has been shipped safely by rail for almost 40 years (over 660 container shipments) without release of radioactivity to the environment. Federal, state and local regulations have been fully met in the past. This EIS addresses issues in the light of the existing laws and regulations and the best information available on the future conditions. The Navy's shipment history demonstrates that the Navy is committed to ensuring the safety of spent nuclear fuel transportation. This commitment to safety will continue in the future as the new laws and regulations affecting transportation of spent nuclear fuel and high-level radioactive waste are implemented. For the sake of comparing a reasonable range of alternatives the current regulations have been applied conservatively in the EIS transportation analysis.

Specific transportation routes have not been evaluated for shipment of naval spent nuclear fuel to a repository or centralized interim storage site because that will be the subject of the site-specific EIS for the particular facility. Transportation of naval spent nuclear fuel to a repository or centralized interim storage site will be addressed in the repository EIS analysis. The Navy will participate and contribute to that EIS, as appropriate. This participation will include, at a minimum, the contribution of naval spent nuclear fuel to the cumulative impact for all of the spent nuclear fuel shipments to the designated repository.

Additional discussion to clarify these points has been added to the EIS in Chapter 7, Section 7.1 and Appendix B, Section B.1.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

5.1 Background Information on the Current and Projected Inventory of Naval Spent Nuclear Fuel

The information in Appendix B provides the details of the transportation analysis used in this EIS including the analytical codes (Section B.3) and the input parameters (Section B.5) used to estimate the impacts presented in the document. Appendix B provides enough information on the sources of radioactivity, including data for each radioactive nuclide, to permit an independent reviewer to perform analyses of the impacts of normal operations and hypothetical accidents for a wide range of conditions similar to or differing from those analyzed.

Information provided in the EIS enables the reader to determine that the average amount of naval spent nuclear fuel in each container shipped from the Idaho National Engineering Laboratory to a repository over the period covered by the EIS will be:

Alternate	# of Containers	MTHM per Container
Multi-Purpose Canister	300	0.22
No-Action	425	0.15
Current Technology/Rail	325	0.20
Transportable Storage Cask	325	0.20
Dual-Purpose Canister	300	0.22
Multi-Purpose Canister	500	0.13

This table has been added to the EIS (Chapter 7, Section 7.3) to facilitate reader understanding.

A typical detailed shipping schedule by year is presented in Appendix B, Table B.4 of the EIS.

The above quantities of metric tons of heavy metal (MTHM) per container are consistent with the total amount (65 MTHM) expected to be in existence by 2035 documented in the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management EIS (DOE 1995). It can be determined in DOE 1995 that each shipping container being transported from shipyards to the Idaho National Engineering Laboratory on the average contains 0.11 MTHM of naval spent nuclear fuel. The increased amount in each container being shipped from the Idaho National Engineering Laboratory takes into account the fact that excess non-fuel structural material is removed from each fuel assembly during the examination process at the Idaho National Engineering Laboratory, thus, making more space available in the containers.

Additional specific information in the EIS on MTHM is provided in Chapter 1, Section 1.0 of the EIS. Characteristics of naval spent nuclear fuel are described in Chapter 2, Section 2.3, and the planned reductions in the number of nuclear-powered naval vessels is described in Section 2.7, along with a graph provided as Figure 2.4. Appendix B, Table B.1 provides relative container capacities for the cargo and Table B.2 shows the number of shipping containers for each alternative.

G. 5.2 Heavy-Haul Truck Transportation

The DOE's Notice of Intent for Preparation of an Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (60 FR 40164), states that "The potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and DOE facilities will be assessed. Regional transportation issues include: (a) technical feasibility, (b) socioeconomic impacts, (c) land use and access impacts, and (d) impacts of constructing and operating a rail spur, a heavy haul route, and/or a transfer facility...". The Navy will work with the Department of Energy to ensure naval spent nuclear fuel is properly addressed in the Repository EIS analyses. Comparison of heavy-haul transportation routes is pertinent to this EIS to the extent that it helps to discriminate among the alternatives considered.

All of the alternative container systems would be suitable for heavy-haul transportation, as illustrated by prior use of the M-140 containers in heavy-haul transport. However, it is accurate to state that the M-140 based alternatives would be less suitable due to size, height, and weight. This statement has been added to Chapter 3, Section 3.2 of the EIS.

The Navy is aware that no rail link to the Yucca Mountain site currently exists, and that if it were to become the site of a repository or centralized interim storage facility, heavy-haul transport might be used in place of a rail connection. However, the resolution of that issue will depend on the site eventually selected and the evaluation of the environmental impacts and other factors specific to that site. The routes, distances, and potentially affected populations would be the same for all of the alternative container systems considered for naval spent fuel because the shipments will use the same route--the route selected for shipment of commercial spent nuclear fuel and high-level radiological waste to the repository or centralized interim storage site. Similarly, all container systems considered would have the same design dose rate, a maximum of 10 millirem per hour at 2 meters, as required by the Department of Transportation regulations (49 CFR 100 et seq.). Therefore, the key difference in the alternatives for the purposes of comparing the impacts associated with heavy-haul transport for naval spent nuclear fuel using the alternative container systems is the number of shipments. Text which explains this matter has been added to Appendix B, Section B.4.

The radiological risks of shipping naval spent nuclear fuel have been conservatively analyzed in this EIS and are described in Appendix B, Section B.5.1. The analyses use a train speed of 15 miles per hour. This is slower than the actual expected average transport speed. Using the slower train speeds is more conservative because that results in higher calculated radiation exposure to the public (trains spend more time proximate to the public). This conservatively slow train speed means that the exposure associated with the transport speeds for possible heavy-haul transport would be similar to the results for rail shipments of the same length over similar routes (e.g., Caliente to Yucca Mountain).

It is unlikely that passengers in recreational vehicles and buses (elevated vehicles) traveling in the vicinity of an oversized load on a heavy-haul transport vehicle would be as close as the 2 meter distance of the regulatory package maximum external exposure of 10 millirem per hour. First, the length of the tractor and the overlap of the trailer on the sides and at the rear would prevent any vehicle approaching as close as 2 meters (about 6.5 feet) to the exterior surface of the container. Second, the routine safety precautions for shipping would involve at least one escort vehicle accompanying the tractor-trailer rig due to its size and speed per Nevada transportation regulations. The escort vehicle would add several meters to the distance from the spent nuclear fuel shipping cask. In the EIS a maximally exposed individual for shipments has been described in Appendix B, Section B.3.1, and the results in Table B.10 are evidence of small impact for such a person.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Containers used for legal-weight truck transfer would also be designed to produce a maximum exposure rate of 10 millirem per hour at 2 meters in accordance with the DOT regulations and their use would present the same opportunity for the elevated vehicles to be in traffic with them as would occur for heavy-haul transport. Further, many more legal-weight truck shipments would be required to move all spent fuel. Text has been added to Chapter 3, Section 3.7 which summarizes the evaluation of legal-weight truck use.

The range of accidents analyzed in the EIS Appendix B, Section B.5.2 would bound the impacts from a hypothetical heavy-haul transportation accident at an intersection in Las Vegas, such as at the intersection of I-15 and U.S. Route 95 on a week day during rush hour. Such an event would be expected to produce impacts which would be within the scope of the accidents analyzed in Section B.5.2, using an urban population density of 3,861 people per square kilometer. These severe hypothetical accidents have also been analyzed for the rural population density of six people per square kilometer and would produce estimates of effects similar to those which might result from the scenario postulating an accident at the intersection of Nevada State Routes 375 and 318 at Crystal Springs.

Text has been added to Chapter 7, Section 7.3.3 and to Appendix B, Section B.5.2 to specifically cover these points.

5.3 No section was provided by the State of Nevada.

H. 5.4 Reliance upon the Modal Study

Sections B.4 through B.5 of Appendix B describe the use of two separate analytical approaches to evaluate the impacts to human health and the environment associated with transportation of naval spent nuclear fuel, a probabilistic assessment of risks based on methodology described in Shipping Container Response to Severe Highway and Railway Accident Conditions (NRC 1987--the Modal Study) and a deterministic estimate of maximum consequences of a transportation accident. The commenter's assertions focus only on the probabilistic approach to estimating risks and the commenter makes no criticism of the deterministic estimates of the maximum consequences used as an alternate method for assessing the impacts that might result from an accident. Estimates of impacts were derived using two independent methodologies and presented in the EIS intentionally to avoid relying solely on a single method to compare impacts among alternatives.

The Navy included in the Draft EIS a deterministic analysis of a transportation accident which would result from very severe damage to a shipping container, even though the Modal Study utilized by the probabilistic approach predicts such an accident would happen in less than one out of more than ten million accidents. This accident is identified as the “Maximum Consequences Accident” and is described in Section B.3.2. This analysis postulates that a shipping container transporting naval spent nuclear fuel might be breached so that it could leak radioactive material to the environment and that the fuel inside might have been damaged enough to release fission products.

The detailed results of the analysis of this maximum consequences accident are presented in Table B.13. This table shows the human health impacts which might occur if the event were to occur in a rural, urban, or suburban area. This accident analysis is conservative in that it would produce impacts unlikely to be exceeded by the most severe accident that might reasonably be foreseen during shipping.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
Nuclear Waste Project Office, Nevada

Text has been added to Section B.3.2 of the EIS to explain more fully that the Navy has used both a probabilistic and deterministic approach to analysis of transportation accidents for the comparison of alternatives and has not placed sole reliance on the study criticized by the commenter. Text has also been added to Chapter 7, Section 7.3.3 to direct the attention of the reader to this assessment and the dual approach.

The assertion by the commenter that the EIS relies excessively on the Modal Study is not correct. The analyses presented in this EIS use the Modal Study in only one portion of the development of the probabilistic estimate of the risks associated with accidents which might occur during shipment of naval spent nuclear fuel. Other key data required to perform the assessment were developed from the best available information. The estimate of risk is based on potential routes through representative population areas over a range of distances (see Section B.4). The national average probabilities of accidents are used (see Section B.3.2). The population densities and the fraction of each route in rural, urban, and suburban areas were input to the analysis (see Section B.3.2). Pasquill D and F meteorological conditions were used to represent the 50 percent and 95 percent conditions, as shown to be appropriate by the National Oceanic and Atmospheric Administration. The amounts of radioactive material which might be released for accidents of specified severity were determined specifically for naval spent nuclear fuel, using the characteristics of naval fuel and the amounts of fission and activated corrosion products present in both typical submarine and surface ship fuel (see Section B.5.2 and Table B.8).

The Modal Study was used to provide only one parameter in the equation in Section B.3.2 used to estimate accident risk: the probability that, if an accident were to occur, the severity of the accident might exceed a given level. That is, the Modal Study was used only for the purpose of estimating that if an accident were to occur what the probability might be that the temperatures and strains produced by the accident would exceed certain levels. The accident risk calculations were performed especially for naval spent nuclear fuel using the widely accepted RADTRAN and RISKIND computer programs.

The Modal Study offers the best available data for estimating the probability that a given level of severity might be exceeded if an accident occurs during shipping. The commenter does not suggest a better source for such data. The Modal Study has become the standard source for estimating such probabilities in probabilistic analyses of risks for shipping spent nuclear fuel and radioactive waste, as documented in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (DOE/EIS-0203-F), the Environmental Impact Statement on a Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218-F), and in the Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE/EA-0912).

Reassessment of a shipping cask using more detailed structural and thermal analyses was performed subsequent to the original Modal Study, and the results were comparable to the original results. This reassessment is discussed in the Packaging and Transportation of Radioactive Materials (PATRAM ‘95) conference abstract entitled “Transportation Accident Response of a High-Capacity Spent Fuel Truck Cask” (W. O’Connell, LLNL; E. McGuinn, B&W Fuel Co.; W. Lake, Department of Energy).

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
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Some observations are merited relative to the comments concerning the application of the Modal Study in the analyses in this EIS. First, the analysis in this EIS used the specific fuel characteristics of naval spent nuclear fuel and did not rely upon the characteristics or response of the spent fuel examined in the Modal Study. Therefore, the commenter's criticisms of the Modal Study relative to the characteristics and response of spent fuel and differences between the characteristics and response of naval and commercial spent nuclear fuel do not apply.

Second, the commenter states that the Modal Study failed to consider the range of real world scenarios. The report referenced by the commenter uses the omission of criticality and immersion in water as one basis for the contention that the full range of scenarios was not evaluated (see page 24 of the report). The naval spent nuclear fuel to be shipped to a repository or centralized interim storage facility will include neutron absorbers mechanically fixed in the fuel assemblies in such a manner that they could not be dislodged in an accident, eliminating the chance of criticality, even if the container or the fuel were completely or partially immersed in water. Immersion in water would extinguish any fire and increase heat capacity, ameliorating and reducing the effects of a hypothetical accident and causing it to be less severe. Therefore, this contention in the report referenced by the commenter does not apply.

Third, the report referenced by the commenter also cites as another reason for contending that the full range of scenarios was not evaluated the fact that tests of containers for the Modal Study used the conditions specified in federal regulations (10 CFR 71) (see pages 24 and 25 of the report). The report admits that the tests specified in 10 CFR 71 were designed to represent the worst conditions that could prevail in almost any accident and that impacts with any real objects, such as bridge abutments, would absorb some impact energy and that such collisions are less limiting than those with the unyielding surface used in the impact testing required by 10 CFR 71. Thus, the arguments concerning the range of scenarios advanced in the report seem to rest on the contradictory contentions that the Modal Study scenarios included only accident conditions which are more severe than would be expected to actually prevail but the requirements of 10 CFR 71, which specify these tests, might somehow fail to include real world conditions which might be more demanding.

Finally, the commenter criticizes the Modal Study for failing to incorporate the design features of current generation shipping containers, such as the method of securing the container closure and the use of solid neutron shielding in place of water (see pages 17 and 18 of the report). The EIS evaluates six broad categories of container systems, some of which are still in development. For example, the accident analysis in this EIS is not restricted to shipping containers using depleted uranium for shielding, as the commenter implies, or lead, as discussed in the report cited by the commenter, but also covers shipping containers covering designs using other shielding materials, such as steel. Systems employing bolted, welded, and other types of closures are included in the alternatives. Further, the container systems currently being developed make use of solid neutron shielding material and provide appropriate heat transfer methods. Thus, the EIS analysis has properly considered a reasonable range of current and planned container system designs.

The preceding observations address the criticisms leveled by the commenter at the validity of the application of the Modal Study to the analyses in this EIS. The facts that the probabilities of transportation accidents are determined from the mileage traveled in each state and the individual accident probability for that state, the consequences are evaluated using the widely accepted RADTRAN and RISKIND computer programs and the characteristics of naval spent nuclear fuel and the population densities for the routes considered, and that maximum consequences accidents are presented independent of any probabilities based on the Modal

Study shows that the EIS does not place sole or excessive reliance on the data criticized by the commenter.

I. 5.5 Consequences of Severe Transportation Accidents

Appendix B information provides the details of the transportation analysis used in the EIS including the analytical codes (Section B.3) and the input parameters (Section B.5) that determine the results presented in the document. The EIS looks at design basis and beyond design basis accidents to compare the alternative container types and not for the purpose of evaluating specific transportation routes. Low probability events, including those with a probability greater than 10^{-7} per year, i.e., greater than one chance in ten million per year, are included. The EIS provides in Appendix B and in the Department of Energy reference document, (e.g.,the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement of April 1995), the detailed description of input values used in the RISKIND analysis requested by the commenter. For example, DOE 1995 identifies that the wind speed used for the Pasquill D (normal meteorological conditions) was 4 meters/second, while the wind speed for Pasquill F (stable meteorological conditions) was 1 meter/second. Uncertainties associated with the analysis of impacts of accidents are discussed in Section B.3.4. Appendix B provides in Table B.13 the maximum health consequences of a severe accident in a rural area and in a major urban area. Thus, the Navy considers there is enough information on radiation, radioactivity, and other aspects of operations or hypothetical accidents to allow independent calculation and verification of all estimates of environmental impacts.

Chapter 5, Section 5.9 of the EIS provides an analysis of the possible effects other than on human health for hypothetical accidents which might result in a release of radioactivity from containers of naval spent nuclear fuel at the Idaho National Engineering Laboratory. The analysis shows that for the most severe accidents, an area of less than 630 acres extending about 2.2 miles downwind might be contaminated to the point that exposures could exceed 100 millirem per year. This maximum affected area and associated impacts would likely bound the impacts that would result from the most severe transportation accident. The analysis in Section 5.9 discussed impacts such as preventing people from going to their jobs, short-term limits on access, land use and the local ecology.

Since the actual environmental impacts associated with all of the alternative container systems considered in the EIS would be small, there is no reason to believe that shipment of naval spent nuclear fuel at any of the locations evaluated would have any significant effect on tourism, an observation supported by almost 40 years of naval spent nuclear fuel management and shipments including populated areas around naval and private shipyards in Hawaii, California, Washington, Virginia, South Carolina, Connecticut, Maine, and New Hampshire. Even the impacts of hypothetical accidents are limited in extent and small enough that there should be no long-term impacts.

The possible environmental impacts of hypothetical accidents during shipment of naval spent nuclear fuel are very similar for all of the container systems evaluated and no single alternative shows a markedly better or poorer performance than the others. Therefore, the effects of the analysis suggested by the commenter would not provide a basis for selecting one system over the others. A discussion of the impacts other than on human health for transportation accidents has been added to Chapter 7 of the EIS in order to make it easier for the reader to evaluate impacts of the nature outlined by the commenter.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
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J. 5.6 Use of Dedicated Trains

The shipment of naval spent nuclear fuel containers in general commerce, i.e., as part of freight trains carrying other cargo to many destinations has proven to be acceptable and practical in almost 40 years of experience, during which over 660 container shipments of naval spent nuclear fuel have been done safely. This practice is not especially complex and has been proven not to increase the difficulty or hazards of point-of-entry inspections for railroad or other personnel. It has not contributed to any derailments and the railroads have provided clearance for the shipments and associated railcars, frequently being involved in the design process for the systems. The shipping containers are designed to meet the requirements for shipping in general commerce, including withstanding high temperature fires. Safety precautions, such as using buffer cars, have worked well over time.

Although future spent nuclear fuel shipping practices for transportation to a repository or centralized interim storage site have not been defined, the Navy will ensure that applicable regulatory requirements will be fully met as they have been in the past. The transportation analyses performed in this EIS are conservative and are based on the best data available to determine current and future impacts to human health and the environment.

The issue of whether dedicated trains will be used to ship naval spent nuclear fuel to a geologic repository or a centralized interim storage facility has not been decided and does not affect the analyses in the EIS since conservative assumptions were made concerning transport speed and other factors. The safety and practicality of making the shipments in general commerce have been established. The number of containers of naval spent nuclear fuel is the same for any of the alternative systems considered and this is the primary factor in determining the environmental impacts associated with the decision supported by this EIS. Therefore, the analyses in Chapter 7 and Appendix B sufficiently evaluate the alternative containers.

K. 5.7 Consequences of a Successful Terrorist Attack

The consequences of naval spent nuclear fuel storage facilities being struck by projectiles from weapons were specifically considered in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement of April 1995, Appendix D to Volume 1. Attacks using anti-tank weapons or other specialized weapons, as well as conventional explosives, were evaluated. This evaluation was performed as part of the analysis of possible terrorist or military attack. The effects of such an attack were shown to be less than the limiting accidents analyzed in the EIS, specifically the crash of a large jet or an earthquake (Appendix D, Attachment F, Section F.1.2).

The reasons that the effects of a projectile from an anti-tank weapon striking one of the storage containers would be less severe than the accidents analyzed are: (a) anti-tank weapons would be likely to cause a self-sealing penetration in the metal of a container, unlike that which is assumed from the airplane crash (impact from a 50 inch diameter engine rotor); (b) there is no explosive material inside the container, so it will not "blow up" as a tank would if hit by such a weapon (in an attack on a tank, the ordnance inside the turret detonates from the energy injected into the turret by the anti-tank shell causing the turret to “blow up”); (c) there would be no fire to disperse the radioactivity that is released when the container is breached, unlike an aircraft crash where the jet fuel might pool, ignite, and create such a fire. The rugged design of containers and the thick walls of water pools, combined with the shock-absorbing nature of water with a free surface, reduce the effects of other types of explosive charges.

Commenter: Robert E. Loux, State of Nevada, Agency for Nuclear Projects
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The fraction of the total amount of radioactive material in a shipping container of naval spent nuclear fuel which might be released by the severe hypothetical accident is analyzed and described in detail in Appendix B, Section B.5.2. The release of radioactive fission products and the results are comparable to the release described in the extreme test cited in the Nuclear Regulatory Commission report and outlined by the commenter. Therefore, for the events cited by the commenter the conclusion is that the accident analyses in Appendices A and B include events with consequences comparable to the most severe terrorist attack scenarios specified by the commenter.

The number of fatalities estimated would be lower for naval spent nuclear fuel than for the commercial spent nuclear fuel in the event of a terrorist attack with explosives or similar weapons because of the design of naval nuclear fuel for use in combat. This design places a high premium on surviving explosions and kinetic shock and produces fuel that is much stronger than commercial nuclear fuel assemblies (e.g. naval fuel can withstand shock loads well in excess of 50 times the force of gravity). Section B.5.2 and the information in Table B.8 provide a detailed description of the percentages and absolute amounts of naval spent nuclear fuel that might be released in the event of a severe accident, or an extremely severe terrorist attack, similar to the three scenarios identified by the commenter.

Similarly, the population densities and other conditions used in the severe hypothetical accident analyses performed for this EIS encompass the range of severity of the effects of terrorist attack at locations mentioned by the commenter. For example, the population assumed for urban areas is greater than 3326 people per square mile. The analysis results described in Table B.13 of the EIS include impacts on rural areas and urban areas like Las Vegas during rush hour or during a major special event as mentioned by the commenter. Accidents in suburban areas have also been analyzed.

The case of a terrorist attack involving the capture of a cask and its subsequent destruction by the use of high-energy explosive devices is an event which would not be credible (having a probability much lower than the 10^{-7} criterion) for National Environmental Policy Act EIS analyses. However, the consequences of such an event could be estimated by using the information provided in Appendix B, Section B.5.2 and in Table B.13. Since the Table B.13 consequences mostly consist of impacts due to the release of fission products, these results could be multiplied by a factor of 1 to 100 (where 100 represents a full release of contents), depending on the damage assumed in any other type of incredible hypothetical accident scenario. Moreover, to determine the risk of such an event, the probability of the event must then be multiplied by the newly estimated consequences. The probability of the capture attack event would be much less than the 10^{-7} probability used in the EIS maximum consequences analysis because even if this attack would occur it is even more unlikely that it would happen in an urban area (an assumption used in the maximum consequences analysis). The probability would most likely be several orders of magnitude lower; therefore, the risk (probability times consequences) would be less than the risk for the maximum consequences analysis presented in this EIS. As stated in Section B.3.4, Analysis of Uncertainties, the results in Appendix B are believed to be 10 to 100 times larger than what would actually occur. The use of conservative analyses is not an important problem or disadvantage in this EIS since all of the alternatives have been evaluated using the same methods and data, allowing a fair comparison of all of the alternatives on the same basis. Furthermore, even using these conservative analytical methods, the risks for all of the alternatives are small, which greatly reduces the significance of any uncertainty analysis parameters.

The range of analyses performed in Appendix B of this EIS uses assumptions which include: the cask is breached, the contents are damaged and the radioactive materials have been released, and the cask has been damaged with no radiological release. However, the scenario resulting in an undamaged cask has not been described specifically since there is no risk to the public associated with release of radioactive material. The cask design and materials used have been factored into the evaluations described in the EIS and presented in Chapter 7 and Appendix B.

In summary, the terrorist attack scenarios described by the commenter fall within the bounded range of accident analyses performed for this EIS and appropriate text has been added to Chapter 7 and Appendix B to help the reader better understand the range of transportation analyses performed for this EIS.

L. 6.0 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse effects on human health or the environment of its programs, policies, or activities on minority populations or low-income populations. This EIS addresses environmental justice for minority, low-income, and Native American populations in sections related to manufacturing (Chapter 4, Section 4.8), loading and storage (Chapter 5, Section 5.8), and shipment over public transportation routes (Chapter 7, Section 7.3.5), and in the Executive Summary.

Analyses of the potential impacts associated with all of the container systems considered for management of naval spent nuclear fuel are presented in this EIS for manufacturing, loading and storage, and shipment over public transportation routes. These analyses show that any effects on human health or the environment would be small for all of the alternatives considered. The potential impacts due to normal operations or hypothetical accident conditions associated with the alternative container systems evaluated present little or no significant risk to public health or the environment and do not constitute an adverse impact to any population in the vicinity of the activities involved, including Native American, minority and low-income populations.

This EIS includes specific demonstrations that the impacts resulting from any of the alternatives considered would not be high and adverse for any group. For example, Chapter 7, Section 7.3.5 includes an analysis of the impacts of shipments on minority and low-income populations. This analysis assumed that all of the latent cancer fatalities which might occur as the result of a severe accident during transportation of naval spent nuclear fuel using any of the container systems considered were members of minority populations and demonstrated that they would experience far less than one additional fatality per year. Section 7.3.5 also includes a comparison of this less than one potential additional accidental death per year among members of minority populations to the approximately 7400 deaths in minority populations due to traffic accidents in 1994 to provide perspective.

Similarly, the radiation exposure from incident-free shipment for the total number of shipments for almost 40 years is presented in Section 7.3.5 for the Fort Hall Reservation as a concrete example of the very small risk to a minority population or low-income population who might be exposed to every shipment. The Shoshone-Bannock Reservation at Fort Hall was used to illustrate the absence of high and adverse impact because every shipment of naval spent nuclear fuel would pass through those Native American lands on the way from the Idaho

National Engineering Laboratory to any repository. Other minority or low income populations would not be exposed to human health or environmental effects which would differ greatly from those estimated for Fort Hall. Similarly, the accident risks in Chapter 7, Table 7.4 and the maximum consequences of a severe hypothetical accident in Appendix B, Table B.13 were determined for urban, suburban, and rural populations and the input to the analyses make these results applicable to any population group in those categories. The discussion of environmental justice in this EIS is sufficient and in compliance with the Council on Environmental Quality regulations in 40 CFR 1502.2(b).

As pointed out by the commenter and described in Section B.4 of the EIS, specific routes, including the fraction of the total distance of each route that would be through rural, urban, or suburban localities, were used to compare the possible impacts of the alternatives. Also as identified in Sections B.4 and B.5, the analyses used estimates of the population density in the rural, urban, and suburban areas which are unlikely to be exceeded. The probabilities of accidents for the transportation used in the analyses were specific to each state along the route to correctly represent variations in accident rates, as described in Section B.5.2 of the EIS. Table B.13 provides a summary of the maximum consequences of a severe hypothetical accident broken down by rural, urban, and suburban areas.

As shown by the analyses in this EIS, including the analyses for minority, Native American, or low-income populations presented, there are no high and adverse impacts associated with the alternatives considered. Even if all of the impacts were assumed to occur only among minority or low-income populations, the impacts for any of the container systems for naval spent nuclear fuel management would not constitute a disproportionately high and adverse impact to any particular segment of the population, minorities and low-income groups included. Since there are no disproportionately high and adverse human health or environmental effects for any population, no mitigating measures beyond the normal practices for shipment of spent nuclear fuel will be necessary.

The text of Chapter 7, Section 7.3.5 of the EIS has been modified to enhance the reader's ability to use the results of the analyses to evaluate the possibility that any of the alternatives might have a disproportionately high and adverse impact on minority populations or low-income populations.

M. 7.0 Socioeconomic Analyses

Although selected research conducted in Nevada indicates that certain “nuclear related activities” have the potential to generate negative socioeconomic impacts, the results of this research have not been borne out by empirical studies of actual events. In locations where nuclear-related activities occur, such as Idaho National Engineering Laboratory and the Savannah River and Hanford sites, the socioeconomic environment does not appear to have experienced negative impacts of the type or magnitude that the Nevada research would predict based on the nuclear-related activities conducted at these locations. Indeed, despite its proximity to the Nevada Test Site and the decades of nuclear-related activities that have occurred there, including over 600 detonations of nuclear weapons above or below ground, Las Vegas has been one of the fastest growing major metropolitan areas with one of the fastest growing economies in the United States since 1980. Similarly, the area around the Idaho National Engineering Laboratory, including the Craters of the Moon National Monument, has not exhibited the sort of negative socioeconomic effect predicted by the Nevada studies.

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The evaluation of socioeconomic consequences in the Navy EIS explores issues for which there is basis for concern. The nature of socioeconomic impacts considered in the EIS can be positive or negative. Analysis was conducted in as much depth as practical given the absence of defined manufacturing sites, an interim storage site, or a repository. The absence of specific locations, coupled with what appears to be non-universal empirical implications of nuclear-related activities regarding a stigma, removes the utility of exploring that issue in this EIS. Should either of the last two facilities be proposed for development at a particular place, a site-specific National Environmental Policy Act document would be prepared to support that proposed action at the proper time. The Department of Energy has already announced its intention to prepare an EIS for a geologic repository at Yucca Mountain.

The purpose of this EIS is to evaluate the differences in impacts which might be produced by the alternative container systems considered for storage and shipment of naval spent nuclear fuel. Since all of the alternatives involve the shipment of spent nuclear fuel, speculation concerning impacts like those theorized by the commenter does not assist in the comparison of alternatives.

N. 8.0 Waste Acceptance

The EIS is correct in stating that the Yucca Mountain Site is the only site currently authorized by legislation for site characterization as a geologic repository for spent nuclear fuel. The Nuclear Waste Policy Act, as amended in 1987, (refer to 42 USC 10133) directs the Secretary of Energy to carry out appropriate site characterization activities at the Yucca Mountain Site necessary to submit an application to the Nuclear Regulatory Commission for a construction authorization for a geologic repository for spent nuclear fuel and high-level radiological waste at that site. The Yucca Mountain Site is the only site so authorized in 42 USC Chapter 108.

The commenter states that it is not clear that the Nuclear Waste Policy Act authorizes the disposal of naval spent nuclear fuel in the geologic repository proposed under the Act. However, as pointed out by the commenter, naval spent nuclear fuel conforms with the definition of spent nuclear fuel in 42 USC 10101 and naval spent nuclear fuel is specifically included in the statement of applicability in 42 USC 10107 (a) and (c). Taken together, these sections indicate that disposal of naval spent fuel in the repository is authorized by the Act.

In the final analysis, nothing in the Act or elsewhere in law precludes using Yucca Mountain as the terminus in the analysis covering shipment of naval spent nuclear fuel. The Department of Energy believes that disposal of naval spent nuclear fuel is authorized under the current wording of the Act and has adopted the policy that naval spent nuclear fuel will not be reprocessed to recover the uranium-235, but instead will be buried in a geologic repository. The issue of authority for disposal will be fully resolved prior to shipment of any naval spent nuclear fuel to a geologic repository. The resolution of this issue will fully consider the safety of the repository, the appropriate level of protection for classified information, and the other issues cited by the commenter. It should be noted that the Nuclear Regulatory Commission, the Environmental Protection Agency, and others already have the capability, experience, and knowledge to deal with the classified characteristics of naval spent nuclear fuel.

Notwithstanding any questions of authority, it is necessary to select a container system for dry storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory, shipment to the location selected for its ultimate disposition, and possibly for disposal in a geologic repository. Therefore, this EIS has been prepared in compliance with the requirements of the National Environmental Policy Act to address the human health and environmental impacts associated the necessary activities, including evaluation of the impacts of manufacturing and employing various alternative systems for storage and delivery to a geologic repository for naval spent nuclear fuel.

O. 9.0 Waste Characteristics

As the commenter points out, the waste acceptance criteria for a geologic repository have not yet been established. The Navy is familiar with the developments in this area and is following this work to ensure compatibility with the requirements when they are specified. The Navy fully intends to comply strictly with the waste acceptance criteria for any repository or centralized interim storage facility.

The collection of naval spent nuclear fuel records and other data will be accomplished in accordance with the guidelines established by the Office of Civilian Radioactive Waste Management, as stated by the commenter. Pertinent records and data will be collected or qualified for use under a program in conformance and compliance with DOE/RW-0333P, "Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description."

This EIS does not state or imply at any point that naval spent nuclear fuel or any other waste will not have to adhere to applicable requirements or acceptance criteria. This EIS presents analyses of the impacts associated with the use of the alternative container systems considered for storage and shipment naval spent nuclear fuel and special case waste to a repository or centralized interim storage facility. It also goes further and provides the source terms and similar information used in the analyses of impacts to enable an independent reviewer to estimate the impacts using the same or different methods and conditions. The analysis of impacts for a geologic repository or centralized interim storage facility will be included in a site-specific EIS prepared for such a facility by the Department of Energy. The impacts of disposal of naval spent nuclear fuel at such a facility will be included in that EIS as part of the Department of Energy-owned fuel identified in the Notice of Intent to prepare an EIS for a geologic repository (Federal Register of August 7, 1995, 60 FR 40164).

All data on the characteristics of naval spent nuclear fuel required to evaluate impacts associated with selection of a container system for the management of naval spent nuclear fuel are presented in Appendices A & B of this EIS. Naval spent fuel characteristics necessary for evaluations of disposal will be provided in the required geologic repository EIS. The repository EIS will address the stability of all spent nuclear fuel, including naval spent nuclear fuel, in a repository and potential impacts on human health and the environment.

The theory advanced by C. D. Bowman and F. Venneri in the referenced paper has been criticized by numerous reviewers as having no validity. Papers discussing the fallacies in the Bowman and Venneri theory were presented in a recent technical society conference (Transactions of the American Nuclear Society 1996 Annual Meeting, Reno, NV, June 16-20, 1996, Proceedings of the Embedded Topical Meeting on Department of Energy Spent Nuclear Fuel & Fissile Material Management; 1. Event Tree for Autocatalytic Criticality in Geologic Repositories; 2. Release, Transport and Deposition of PU and HEU in Geologic Media; 3. Transport of fissile and Poison Materials Through Fractured Geologic Media; 4. Minimum Critical Mass of ^{239}Pu-Rock-Water Systems; 5. Neutronic Parametric Study Of Critical Configurations of Plutonium Deposited In Rock Fractures; and 6. Dynamic Response of Heterogeneous Deposits Of TFM in Moist Rock). Additionally, an article published in Nuclear Technology, September 1995 (W. E. Kastenberg, et al.) debunks this theory too. Therefore, naval spent nuclear fuel would not contribute to the risk of concern to the commenter. Moreover, their theory focuses on

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Pu-239 transport; unlike commercial spent nuclear fuel, naval spent nuclear fuel has negligible amounts of Pu-239.

10.0 Environmental Impact and Analysis

P. 10.1 Programmatic Environmental Impact Analysis

In regard to the state of Nevada's request that the Navy stop work on this EIS and divert work to a programmatic EIS, the Navy considers this is not appropriate. Congress has determined that, with respect to the requirements imposed by the National Environmental Policy Act of 1969 (42 U. S.C. 4321), compliance with the procedures and requirements of the Nuclear Waste Policy Act (42 U.S.C. 10101, et seq, as amended) shall be deemed adequate consideration of the "...need for a repository, the time of initial availability of a repository, and all alternates to the isolation of high-level radioactive waste and spent nuclear fuel in a repository..." and that "...alternate sites to Yucca Mountain..." and "...nongeologic alternatives to such site..." need not be considered as alternates. (42 U.S.C. 4321, Article 114(f)).

On August 7, 1995 Department of Energy announced (60 FR 40164) its intent to prepare an EIS in accordance with Nuclear Waste Policy Act for a geologic repository at Yucca Mountain. The environmental issues to be examined in the Department of Energy EIS were identified as including "...the potential impacts associated with national and regional shipments of spent nuclear fuel and high-level radioactive waste from reactor sites and Department of Energy facilities to the Yucca Mountain site ...including impacts of constructing and operating a rail spur, a heavy-haul route and/or a transfer facility..." Following a 90-day scoping period which ended December 5, 1995, Department of Energy deferred action on the EIS until Fiscal Year 1997 for budget reasons. Thus, the programmatic impacts of all the nuclear waste in a repository are properly the subject of the EIS ultimately to be prepared by the Department of Energy and are beyond the scope of this EIS.

Q. 10.2 Environmental Life Cycle Assessment

The life assessment approach is followed in the EIS in those areas where it is within the scope of the EIS and impacts can be identified or estimated. In particular, the EIS covers the concept of raw material extraction in relationship to the manufacture of the container system. Table 4.4 in Chapter 4 lists the total tons of each type of raw material used over a 40 year period in the manufacture of each of the six alternate container systems. Table 4.5 then expresses these amounts in terms of the percentage of the annual U.S. domestic production. It is observed that the amounts of materials used are small when compared to the available production. The EIS then covers in Chapter 4, Section 4.5.2 those components of the container systems which are either recycled or disposed of as nongeologic waste. When the location of the repository is known, the disposal of spent nuclear fuel and high-level waste will be covered in the repository EIS that will be prepared by the Department of Energy in accordance with the Nuclear Waste Policy Act.

The material in Chapters 4, 5, 6, and 7 provides analyses and comparisons of the impacts of all aspects of the manufacture of the alternate systems considered and their use in storing or shipping operations, including waste generation, throughout the life cycle of the systems. This is consistent with the approach recommended by the commenter.

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R. 10.3 Impact Assessment

The Navy has used models which describe the environmental impacts to an accuracy consistent with the significance of the impacts, and has described these models and their use and the EIS. The models and the resulting estimates of impacts are presented in accordance with established practice for documenting scientific work, including use of references. Thus the Navy disagrees with the contention of Nevada that the EIS does not identify accepted models for assessing environmental impacts.

The EIS adequately describes the specific methodology and computer codes used to analyze the impacts. In many cases, this is done by leading the reader through a specific trail to more and more detailed explanations of the methodology. For example, with respect to impacts from airborne releases, the first paragraph of Chapter 5, Section 5.2.2 contains the sentence "...The specific methodology and computer codes used for these analyses are presented in Appendix A, Section A.2.3..." Examination of Section A.2.3 reveals a section that is nine pages long and this Appendix, in turn, refers to many other published documents. For example, the paragraph on the computer codes used contains the sentence "...These codes are discussed in detail in the Programmatic SNF and INEL EIS (DOE 1995 Volume 1, Appendix D, Attachment F, Section F.1.3.6)". This reference in turn provides a one page long summary with descriptions of each computer code and in each description there are references to more detailed descriptions. This use of references to help document the methodology is consistent with the guidance of the Council of Environmental Quality on reducing excessive paperwork and providing analytic vice encyclopedic environmental impact statements (40 CFR 1500.4).

S. 10.3.1 Environmental Risk Assessment

The commenter's statement that the long-term predictions for disposal require use of the best practicable methodology in this EIS is outside the scope of this environmental impact statement. The Navy Container System EIS does not discuss or evaluate the disposal of spent nuclear fuel or high-level radiological waste. The Navy believes the methodology used in the EIS is sufficient for the intended purpose, which is to select among the alternate container systems. This methodology is described in detail in the EIS and in referenced documents. This methodology was selected by the Navy's experts and is appropriate for its intended purpose. This is substantiated by the small impacts. The EIS contains an analysis of uncertainties in Appendix A, Section A.2.7 which in turn refers to more detailed discussions in reference documents.

The EIS applies the approach recommended by the commenter, including the use of the best practicable methodology, to assess the full spectrum of effects on human health and the environment in the comparison of alternatives for storing and shipping naval spent nuclear fuel.

T. 10.3.2 Cumulative Impact Analysis

The basic methods used to evaluate the environmental impacts in the EIS were also used to calculate the individual components of the cumulative impacts. These methods are fully documented in the EIS and in traceable references as described above. Additional discussion of which individual impact components are added together to create the cumulative impacts are then identified in each of the cumulative impact sections of body of the EIS; for example, in Executive Summary Section S.8.1, in Chapter 3, Section 3.8.5 (Summary of Cumulative Impacts), in Chapter 4, Section 4.10 (Cumulative Impacts of Manufacturing), in Chapter 5, Section 5.10 (Cumulative Impacts of Loading and Storage at Idaho National Engineering Laboratory Facilities), in Chapter 6, Section 6.5 (Cumulative Impacts of Unloading at a Repository or Interim

Storage Facility), and in Chapter 7, Section 7.3.7 (Cumulative Impacts of Transportation). The Navy believes that the methods used to evaluate cumulative impacts are properly documented.

U. 10.3.3 Human Health Risks and Safety Impacts Study

The EIS has fully described the approach used to estimate human health consequences. For example, the basic analytical methods used for the calculation of radiation exposure at Idaho National Engineering Laboratory is described in detail in the EIS in Appendix A, and in particular in Section A.2.3 which, in turn, references other more detailed descriptions. As a specific example, the section provides the following discussion:

> "...Exposure is calculated to result from direct radiation from the facility and exposure to contamination released to the air. The exposure pathways are described in detail in the Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory EIS (DOE 1995, Volume 1, Appendix D, Attachment F, Section F.1.3.2) and include all internal and external pathways for exposures, including food and water.
>
> "... Health effects are calculated from the exposure results. The risk factors used for calculations of health effects are taken from Publication 60 of the International Commission on Radiological Protection (ICRP 1991)."

Therefore, the Navy has included the requested description of the approach used to estimate human health effects, both near term and long term. The documents which are the sources of the methods, such as ICRP 1991, provide logical scientific bases and detailed discussions of the uncertainties in the estimation of risks to human health.

V. 10.3.4 Succeeding (Future) Generations

The threat to future generations from geologic disposal will be addressed by DOE in its repository EIS; such an analysis is outside the scope of the Navy Container System EIS. For evaluations which are within the scope of the EIS, such as human health effects from radiological exposure at Idaho National Engineering Laboratory, the EIS presents the results in terms of latent fatal cancers. By using a simple multiplier of 1.46 the results presented can be converted to total health effects, including genetic effects. This is described on Appendix A, Section A.2.3 by the following paragraph:

> "...Cancer fatalities were used to summarize and compare the results in this EIS since this effect was viewed to be of the greatest interest to most people. The number of total health effects (deaths, nonfatal cancers, genetic effects, and other impacts on human health) may be easily obtained by multiplying the latent cancer fatalities by the factor of 1.46, which is the ratio of 7.3×10^{-4} divided by 5.0×10^{-4} from Table A.5 above..."

A straightforward extension of this method would reveal that genetic effects can be obtained by multiplying the latent cancer fatalities by the factor of 0.26, which is the ratio of 1.3×10^{-4} divided by 5.0×10^{-4} from Table A.5.

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W. 10.3.5 Truly Significant, Reasonably Foreseeable Long-Term Impacts

The commenter's concerns about long-term repository performance are outside the scope of the Navy Container System EIS. Evaluation of the environmental impacts of long term repository performance will be included in the geologic repository EIS being prepared by Department of Energy in accordance with the Nuclear Waste Policy Act. Department of Energy announced its intent to prepare this EIS on August 7, 1995 (60 FR 40164).

X. 10.4 Post-project Monitoring

The commenter's concerns about long-term monitoring of the repository are outside the scope of the Navy Container System EIS.

Y. 10.5 Policy and Guidance for National Environmental Policy Act and Regulatory Compliance

A holistic approach related to the disposal of naval spent nuclear fuel in a geologic repository is beyond the scope of this EIS. Such concerns related to a geologic repository are properly the subject of the EIS to be prepared by the Department of Energy in accordance with the Nuclear Waste Policy Act (see the Notice of Intent to prepare this EIS in the Federal Register of August 7, 1995, 60 FR 40164.)

The primary policies and guidance followed by this EIS to achieve National Environmental Policy Act compliance included the National Environmental Policy Act (42 U.S.C. 4321 et seq), the Council of Environmental Quality regulations (40 CFR 1500 et seq), implementing regulations issued by Department of Energy (10 CFR 1021) and the Navy (32 CFR 775) and a document entitled "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements" issued May 1993 by the Office of National Environmental Policy Act Oversight, Department of Energy. Other federal statutes and regulations, executive orders, other laws and regulations and Department of Energy Order are listed in Chapter 8 of the EIS.

As described throughout the EIS, the impacts are presented based on calculations of the estimated releases to various media (air, water, soil) for normal operations and for accidents. The results are based on following all applicable pathways of these releases to determine their impact on man and on the environment. The significance of the impacts is based on the actual calculated results rather than on comparisons to regulations governing the release of potential contaminants or pollutants to the air, water, soil, or other medium. The Navy has applied the holistic approach recommended by the commenter, as demonstrated by the discussions in Chapters 3, 4, 5, 6, and 7 and in the detailed descriptions of analyses in Appendices A, B, C, and E.

Z. 11.0 Relationship Between the Navy Activities and Other Related Activities/Commitments

The planning framework upon which the EIS is based does not depend on the Department of Energy's agreement with the state of Idaho potentially being in competition with utility companies regarding waste acceptance. The standard contract between Department of Energy and utility companies (10 CFR Part 961) identifies that Department of Energy will take title, transport, and dispose of spent nuclear fuel from civilian nuclear power reactor plant owners or generators. The standard contract allows Department of Energy, after it takes title, to transport this spent nuclear fuel to a Department of Energy facility prior to its transportation to a disposal facility.

The Idaho agreement merely excludes the Department of Energy facility at Idaho National Engineering Laboratory as a potential destination.

Appendix B, Table B.3 provides a notional schedule for shipment of naval spent nuclear fuel from Idaho to a geologic repository or centralized interim storage facility that incorporates the requirements of the Nuclear Waste Policy Act and the agreement between the state of Idaho and the federal government. As shown in Table B.3, there would be a small number of shipments to the repository beginning in the year it becomes operational, causing naval spent nuclear fuel to be among the first shipments to such a facility. The number of shipments of naval spent nuclear fuel would increase as the capability of the repository to accommodate commercial spent nuclear fuel builds up to meet the demand. Within ten years or so, naval spent fuel shipments would reach a steady level which could be handled within the expected 300 or so commercial spent nuclear fuel shipments currently used as the steady-state planning rate for the repository. This schedule, or similar schedules, would result in all naval spent nuclear fuel being removed from Idaho by January 1, 2035, as specified in the agreement between the State of Idaho and the federal government.

The container systems considered would be suitable for storage for the period specified by the Idaho agreement with appropriate maintenance and monitoring. This is consistent with the current requirements for licensing and renewal of the license under the Nuclear Regulatory Commission regulations (10 CFR 72) for commercial spent nuclear fuel storage containers of the same type considered for naval fuel.

The Department of Energy has announced its intention to prepare an EIS for a geologic repository for spent nuclear fuel and high-level radioactive waste (see the Federal Register of August 7, 1995, 60 FR 40164). The geologic repository EIS will include a discussion of impacts associated with naval spent nuclear fuel, including appropriate reference to this Container System EIS since the two would be related. It is appropriate to evaluate these geologic repository and container system issues separately, as separate stages of development, as permitted under National Environmental Policy Act regulations (40 CFR 1502.4(c)). The National Environmental Policy Act regulations encourage environmental assessments and environmental impact statements to be tiered to what has been done before and what is planned or anticipated for the future (40 CFR 1502.20) and this is the procedure being followed.

AA. 12.0 Special Case Waste (SCW)

The commenter recommends that the National Environmental Policy Act compliance strategy for the management and disposition of both Navy and non-Navy Special Case Waste (SCW) should be discussed or otherwise clarified in the Navy's Final Environmental Impact Statement. The commenter points out, the Department of Energy has not yet determined its strategy. The analysis of transportation to, and unloading at, a representative repository of Navy-generated special case waste has been included in this EIS to determine whether it may have an impact on selection of a container system because it is reasonably foreseeable that such waste might be disposed of in the same geologic repository as spent nuclear fuel. There is no intention to imply that such a decision has already been made or will be made as a result of this EIS, but it is a factor that the EIS rightfully evaluates in assessing the container system alternatives.

The commenter further states the position that "conducting an analysis which proposes transporting Navy-generated SCW to Yucca Mountain for interim storage or disposal is contrary to the spirit and intent of the National Environmental Policy Act..." and, further "could prejudice pending decisions...." This is not correct. The Navy is not proposing the transport of SCW or naval spent nuclear fuel to Yucca Mountain. The Navy's EIS analyzed the environmental impacts of Navy-generated SCW with regard to facility operations, manufacturing, and transportation in order to see if selection of a container system could be significantly influenced by SCW. The EIS clearly states in the Executive Summary, Section S.1 that it does not presume that SCW would be shipped to Yucca Mountain, but rather this location is used purely for analytical purposes. Chapter 7, Section 7.2, provides the reader with a clear understanding that the suitability of Yucca Mountain has not yet been determined nor has it yet been authorized by law as a location for a centralized interim storage site. Yucca Mountain is used in the EIS as a representative or notional location to ensure the completeness of the calculations.

With regard to the final point in Comment 12, this EIS evaluates container systems for the management of naval spent nuclear fuel which could also be suitable for management of Navy-generated SCW. As stated in Appendix E, Section E.3, it is assumed for the purpose of this EIS that the special case waste could be stored in the same alternative locations selected for storage of naval spent nuclear fuel using the same alternative storage system. Selection of a container system does not preclude use of a co-located storage program, if one were to be established, for both Navy-generated SCW and Department of Energy-managed Greater than Class C waste at the Idaho National Engineering Laboratory. Section E.3 of the EIS addresses this issue as well, noting that although the Department of Energy has identified a project to handle Greater than Class C low-level waste from commercial sources, another aspect is to consider the possibility of using that facility for storage of naval program special case low-level waste until shipment to a centralized interim storage site or a repository for permanent disposal.

The text of the Executive Summary, Section S.1 has been changed to provide additional clarification that this EIS does not presume that Navy-generated special case waste will be shipped to the same repository or centralized interim storage facility as spent nuclear fuel and the EIS does not lead to such a decision.

AB. 13.0 Off-Site Generated Radioactive Wastes

This EIS has been prepared to compare the human health and environmental impacts associated with alternate container systems which might be used for storage of naval spent nuclear fuel at the Idaho National Engineering Laboratory and subsequent delivery to a geologic repository or centralized interim storage facility. Because the location of the repository or interim storage facility does not help to distinguish among the alternative storage systems, the location is a peripheral issue for this EIS. The Nuclear Waste Policy Act (42 USC 10133) specifies that the Department of Energy is to characterize the Yucca Mountain Site as a potential site for a geological repository for spent nuclear fuel and high-level radiological waste. Therefore, the Yucca Mountain Site was used in this EIS as the destination for evaluation of impacts which might be produced by transportation to a repository or centralized interim storage facility.

The comment that the public land orders that established the Nevada Test Site did not establish the site to serve as a waste disposal facility for off-site generated radioactive wastes is correct. However, this does not preclude its use as a geologic repository. The Nuclear Waste Policy Act, as amended in 1987, (42 USC 10172) states that:

> "Property clause provided sufficient textual basis for Congress' authority to enact amendments to the Nuclear Waste Policy Act designating location in Nevada as sole site to be characterized for possible development as high-level radioactive waste repository, where the Nevada location was federally owned land, and thus subject to Congress' plenary power to regulate its use."

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Because the Nevada Test Site is federally-owned land, its use is determined by Congress. The issue of authority for use of the site will be resolved prior to shipment of any naval spent nuclear fuel to a geologic repository, but is not germane to the comparison of alternative container systems for naval spent fuel that is the subject of this EIS. Therefore, this issue is beyond the scope of the actions being considered in this EIS. The resolution of the matter of authority for using of the Nevada Test Site as a geologic repository for the disposal of naval spent nuclear fuel will fully consider the environmental consequences.